Pests

AND THEIR CONTROL

1943

JANUARY

VOL. 11 NO. 1

ORGAN OF THE PEST CONTROL INDUSTRY

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Fumigators
Termite Control Operators
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Insecticide and Supply Mfgrs.

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COOPERATING WITH NATIONAL PEST CONTROL ASSOCIATION

Exterminators, Fumigators, Termite Control Operators, Entomologists, Insecticide and Supply Manufacturers

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PUBLICATION OFFICE, 512 EAST 14th ST., KANSAS CITY, MO.

VOL 11, NO. 1 | JANUARY, 1943 | ESTABLISHED 1933

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"Contributed articles in this publication do not necessarily reflect the opinions of the editors. The editors invite discussions, comments and all types of literary material pertaining to pest control and pests from any person interested in the advancement of the field."

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Published monthly by PESTS, 512 East 14th Street, Kansas City, Missouri. Subscription rate in the United States and Possessions $3.00 per year; Foreign $3.50 per year; Single Copies 25 cents; Bundles of 25 Copies $5.00. Publishers not responsible for unsolicited manuscripts. No manuscripts will be returned. All advertising copy and contributions must be in our hands by the 15th of the preceding month of the issue in which they are to appear. Three weeks' advance notice necessary for change of address. Both old and new address must be given.

EDITORIAL

X Marks "Pests'" 10th Anniversary

WITH this issue, PESTS, and their control, starts its 11th year as a publication entity. The year just ended has been a year of American participation in the war. Since wars always spell economic dislocation, it was in the cards, perhaps, that when the first Jap Zero over Pearl Harbor opened its bomb-bay and dropped its first bomb, pyrethrum-rotenone rationing would be the order of a later day. The Industry, however, has set about, man-fashion, to mend its broken supply fences; and it is not out of reason to assume that in time it will construct even sturdier fences than any it has known heretofore.

The basic cause underlying these major material scarcities, conditioned, primarily, by matters of Army-Navy pest control priority needs and not by an undue lack of appreciation, in high places, of other war or civilian pest control needs, only serves to emphasize more than ever the indispensability of pest control. Which is not to declare, there isn't room for improvement in said appreciation,—indeed, there is!

We gratefully acknowledge and hope for a continuance of the wise counsel and kindly assistance of our friends, within and without the Industry. That Pests, as a publication, has its imperfections we'd be the first to admit. That progress has been made, we think none will deny. That much more will be made is our pledge. It will be our constant endeavor to publish the kind of a paper that will be worthy of the rising accord of recognition, by Governmental agencies and many entomological officials of the country's leading universities and colleges, of the Industry's import in the war and in peace to follow.

Advertising . . . Confidence Builder

DENYS Wortman, cartoon creator of the nationally syndicated "Metropolitan Movies" series, depicted, in one of his recent drawings, two young women standing before a movie lobby. They faced a large sign containing such screaming superlatives as "SMASH HIT . . . MARVELOUS . . . COLOSSAL . . . STUPENDOUS." One girl turned to the other and casually asked "Have you heard whether it is any good?"

This cartoon, we think, typifies excessive use of superlatives in the advertising field, which, unfortunately, finds its counterpart in the classified telephone directory advertising of still too many PCOs. Reviewing this situation at the Advertising Clinic at the recently concluded NPCA Convention, Martin T. Meyer and John C. Vogel stressed the positive harm in the use of objectionable insurance features . . .low price offers . . . free inspections . . . unqualified guarantees . . . uneconomic advertising space units . . . and the use of such vague, meaningless and oftimes untrue phrases and cliches as: acme . . . permanent control . . . quality service . . . specialists in all phases of pest control . . . Keokuk's best . . . positive control . . . permanent control . . . 100% extermination . . . highest rated chemical . . . no better service . . . absolute guarantees . . . the master of pest control . . . to quote just a few. To continue to advertise in this manner may well serve no purpose other than to cause the public to ask, like the girl in the cartoon, whether the indispensable service which the genuine PCO has to offer is all that is claimed for it.

To create, cultivate and hold the confidence of his prospects and clients is, as G. B. Usserry, of the Better Business Bureau of Pittsburg, Inc., so aptly stated at the Convention, the keystone of the successful PCO's business structure. Without it, he is nowhere. To win it, he must employ a formula in which the advertising ingredient can serve as a valuable catalyst, provided, it is factual in essence, dignified in approach, and clothed preferably, in the language of understatement.

Coloring Fluoride Preparations Advocated

IF further proof were needed of the practical wisdom for compulsory coloration of flouride preparations, the tragic events outlined in the news clipping from which we quote, provides it:

Two Kitchen Workers Arrested In Oregon Hospital Poisonings

SALEM, Ore., Nov. 22 (UP).—Two kitchen attendants at the Oregon Mental Hospital were placed under arrest by state police today after a voluntary patient admitted mistaking sodium fluoride for powdered milk in the preparation of scrambled eggs, which resulted in the death of forty-seven persons and violent illness to 400 others last Wednesday night.

State police arrested Mrs. Mary O'Hare, head cook, and A. B. McKillop, one of her assistants. The arrests were ordered by District Attorney Miller B. Hayden.

McKillop had insisted until yesterday that he went to the basement for powdered milk. Under continued questioning he finally admitted sending George Nosen, twenty-seven years old, who entered the hospital voluntarily for treatment for nervous disorder and was not considered insane. Nosen told officers that he mistook the cockroach poison for powdered milk and brought eight pounds to the kitchen where it was mixed with the egg batter.

Hayden said McKillop would be held on a charge of involuntary manslaughter and Mrs. O'Hare as an accessory.

McKillop exonerated Mrs. O'Hare in his statement to officers, claiming that she had no knowledge of the events that preceded the poisoning.

Dr. John S. Evans, superintendent of the hospital, said that fright caused the hospital kitchen workers to withhold the entire story until yesterday.

Fortunately, regulatory measures of the nature exist in numerous cities, but, unfortunately as the Salem, Ore., news item makes clear beyond question, there's much room for improvement.

Though fully aware of the potential burdens imposed by restrictive legislation in general, we feel certain that, in this particular instance, the PCO will fully agree with the flouride coloration legislation advocacy of Pittsburg's Director of the Dept. of Public Health, Dr. I. Hope Alexander, at the NPCA Convention, and continue to stand four-square for such commonsensical, humane, accident-preventive legislation.

We cannot refrain from commenting that newspaper accounts thus far have not touched upon another vital failure or careless situation involved; namely, why should any flouride have been stored in the first place in close proximity to food products? Perhaps public officials should also be severely censored for permitting such storage arrangements to prevail. Similarly, it is high time that it is recognized that toxic substances are best handled by the PCO.

Bill Jones

BILL Jones had a friend who made good money in the pest control business. Through him he also heard of others who had built up good businesses in this line of work. Bill Jones was very much interested. He decided it was a promising business and he decided to get into it himself. So— , he opened up an office. He made some mistakes but in the main his policies were sound and he was conscientious in his work, and he made a living. However, he was not satisfied with this and studied ways and means of improving his business. He decided that basically his business could be built up no higher and no more satisfactorily than he as an individual had the capacity and training to take care of it. So— , he sought ways of bettering himself and his ability to run his business. He bought some highly recommended books and studied them. He received information of a short course in practical entomology and decided to attend. There he learned of the National Association of pest control operators, immediately joined and later attended the annual meeting of the National Association. While there he saw a trade paper called PESTS which he readily saw was needed to maintain contact with the industry, its problems and his own needs,—and he subscribed. Perceptibly his business improved, his ability to serve his public had improved and he was rendering better service than ever before, and getting greater enjoyment from it.

"I never realized" he said later when reminiscing with an acquaintance, "just what I was getting into when I opened up an office. I made a living but I got nowhere, fast. And then I realized that the man who is content to go along on the knowledge he started out with, will find he is just making a living and his competitors are leaving him behind. When I made every effort to improve myself and my ability to serve, it enlarged my vision and I realized that pest control is a profession. Definitely, it has paid me to take advantange of every means of self-improvement and I expect to continue to do so as long as I am in the business.

We think Bill Jones' ideas are sound. Do you?

Never More Essential!

Rather than delay the eventual return of a ship to service one minute longer than was necessary, Bill Buettner, whose round-the-clock and round-the-calendar Association activities need no introduction, accepted willingly an emergency "must" assignment from the British Ministry to fumigate a ship starting one day before Christmas, subsequent to which it was to be dry-docked; this, despite the fact that he had made plans to relax and to spend a happy Christmas holiday with his family.

From which practical illustration it is evident not only that patriotism knows no holiday, but also how completely essential an anvil the Industry is in forging the metal of Victory. Fumigants, unlike some other important control chemicals, are in supply, and the will, the skill and the spirit to employ them, as always, not lacking. To labor the obvious lesson for the need of adequate supplies at all times, seems hardly necessary.

Correction Revise

There appeared on p. 32, October '42 PESTS, correction item consisting of three tables of research findings, which originally appeared in the September '42 issue, as an integral part of Dr. G. C. Serrard's article "FIVE FUMIGANTS FOR DISINFECTION OF BEDDING AND CLOTHING: A COMPARTIVE STUDY OF INSECTICIDAL PROPERTIES." Unfortunately, two of the figures in Table 1 of October correction were somehow, erroneously transposed. These were the figure "10," appearing in last column under heading "25-inch vacuum" and as part of data on fumigant: "Ethylene oxide mixture," which should properly read "192," and the figure "192," directly underneath, in the same column, and as part of data on fumigant: "Ethylene dichloride mixture," which should properly read "160." It is suggested that readers enter corrections, above noted, in their file of fumigant research material.

Some of the Latest Developments in the Control of Rats and Mice

By **F. E. GARLOUGH**, *Biologist, Division of Predator and Rodent Control, Fish and Wildlife Service, U. S. Department of the Interior.*

Editor's Note: This address was given by Mr. Garlough at the Tenth Annual Convention of the National Pest Control Association, Pittsburgh, Pa., October 27, 1942.

Introduction

IN this discussion we will consider some of the facts and indications that have come to light recently through research studies of scientists, located at educational institutions and research laboratories and of biologists in the field, who are interested in the species of rats and mice, in their living and feeding habits, and in the problems concerned with their control.

Species and Habits

During the investigations of field biologists who have been studying methods of controlling rats in the southeastern States, it was observed that the hair on the underparts of many of the rats was markedly a lemon yellow color and quite distinct from the usual white color of the underparts of the alexandrine species of rats. Dr. Ernest Schwartz of the Smithsonian Institution, who has been studying the species of rats in the United States, has indicated that there may be another species of rat (Rattus frugivorus, the fruit-eating rat) in this country closely associated with black and alexandrine species of rats, which are located chiefly in the southeastern States. These two or three species of rats are more abundant than has been previously recognized in many of the towns and cities in these States.

In the native land of these rat species, which is northern Africa, and eastward around the Mediterranean Sea to Asia Minor, they lived mainly in trees, shrubs and rockpiles. In this country they may be found in trees, shrubs, or in the vines on the outside walls of houses and in the upper stories of buildings.

This is brought to your attention for the reason that the frugivorus, alexandrine and black species of rats are fond of succulent seeds. They select the different kinds of bait materials in the order of fresh vegetables or fruits, cereals and meats. Fresh sweet potatoes are the most readily accepted feed and make a good bait material to use as a carrier for poisons in control operations.

This is the reverse order of food selections made by the common Norway rat which selects first those foodstuffs testing high in fats. This difference in food preferences between the two groups of rats may be due to the difference in their natural habitats. The black, alexandrine and frugivorus species are more at home outside and away from human habitations, and when in buildings they prefer to live apart and not in so close association with human beings. They prefer the warmer portions of the countries in which they live and feed on succulent materials and seeds when they can. The Norway rat, however, has always preferred to live in close association with mankind where it has access to foodstuffs containing higher percentages of fats and proteins. There are exceptions, of course, with both of these groups.

The recent findings of Dr. Curt P. Richter of the Johns Hopkins Hospital have shown that the Norway rat normally selects foods containing a high fat content because their bodies physiologically require it. In the food selection studies at the Wildlife Research Laboratory at Denver, Colorado, when in search of suitable materials for baits in rat control operations, it was observed that the foodstuffs combined into bait formulas, containing a high fat content in relation to the amounts of protein and carbohydrates were the most readily and continuously accepted. The non-fresh bait material that has been found to be most readily accepted in the greatest number of places is prepared as below:

It will be noted from the ratios shown in Table I that a little higher percentage of fat could be used in the bait material and still be within the normal selection range of the rat based on Dr. Richter's findings. The carbohydrate percentage in the bait is higher than the rat normally selects but this is necessary in order to have a carrier for the poison that will remain acceptable to the rat for several days.

Dr. Richter has conducted further experiments which reveal the changes in diet that female rats require when in the three different periods of their normal life, viz., non-breeding, gestation and lactation. (See Table II.)

TABLE I. FORMULA AND COMPOSITION

Ingredients	Formula	Composition*			
	Proportions	Fats	Proteins	Carbohydrates	Moisture, Minerals, Etc.
	lbs.	lbs.	lbs.	lbs.	lbs.
Ground dried bread crumbs	76	0.15	5.39	42.18	28.28
Ground fresh pork fat	22	17.71	0.66		3.63
Cod Liver Oil**	2	2.00			
Totals	100	19.86	6.05	42.18	31.91
Ratio of Composition		3.3	1	6.9	
Dr. Richter's ratio***		4.0	1	1.24	

* Percentage composition as given in Howell's Physiology.
** Olive oil may be used.
*** Ratio based on caloric requirements.

TABLE II. CHANGES IN FOOD REQUIREMENTS FOR FEMALE NORWAY RATS

Periods	Daily Food Requirements			Ratio of Selection		
	Fat (a)	Protein (b)	Carbohydrates (c)	Fats	Proteins	Carbohydrates
	cc	Gms.	Gms.			
Non-breeding	1.2	1.6	2.7	0.75	1	1.7
Gestation	2.1	2.7	2.7	0.77	1	1.0
Lactation	6.1	4.6	3.3	1.32	1	0.71

(a) olive oil, (b) casein and (c) sucrose.

This table shows the increase in the ratio of fat to protein and the decrease of carbohydrate to protein as the females pass from the non-breeding to the lactation period so that a bait material high in fats is an advantage also to increase acceptance by females during the heavy breeding season. While they may breed during the entire year it is heaviest during the spring and early summer.

Table III shows the composition of foodstuffs as compared to an attractive bait material.

This table shows that in order to have a bait material that increases the chances of having a sufficient quantity of the poisoned bait eaten at one feeding to insure the ingestion of a lethal dose of the poison, it may be better to use a mixed bait containing a better balance of the chemical components of foodstuffs. With a chart of this kind it is possible to make up a formula having the relative proportions of fats, proteins and carbohydrates in accordance with the ratios of a mixed bait that has been given. That does not mean, however, that hamburger or canned salmon may not be used alone at times to clear up a bad situation, particularly in a location where the rats have not had ready access to meat products. Because of the demand for hamburger and salmon for use in the war effort, cheaper meats might be tried. Menhaden and sardine products are cheaper and may be found on the market.

Toxic Substances

Strychnine—The supply of nux vomica beans from which strychnine is extracted comes from Indo-China, Ceylon and India. While supplies have been cut off from Indo-China there are still supplies from the other sources to meet present needs. Since only a small amount of strychnine is used in rat control, its shortage will not seriously affect control operations.

Thallium Sulphate—The supply of this chemical, amounting to about two-thirds of total needs, formerly came from Belgium, Poland and Germany. Because of the war this source of supply has been cut off. The domestic supply has increased slightly but so has the demand so the present situation is serious. Through the Pan-American Union organization, contacts are being made with the mining companies of Central and South America. Just recently information has come that thallium has been found in certain mines in Brazil. An effort is being made to obtain a sample of the ore to determine the percentage of thallium present.

Red Squill—There has been only one small shipment of squill received this year from abroad and that is of low toxicity. Importers cannot promise when another shipment may be received.

The process for fortifying low grade squill has been perfected, the details of which were published in the May 1942 issue of the Journal of the American Pharmaceutical Association, Scientific Edition. Because of the uncertainty existing at the present time with respect to the procurement of raw squill powder from abroad, commercial manufacturers have not been interested in installing a production plant to fortify existing stocks of squill powder. The only fortification plant now operating in addition to the small pilot plant of the Fish and Wildlife Service at Denver, Colorado, is one set up by the City Health Department of New Orleans which was designed primarily to serve its own needs. It rests with their own demands whether this Department will be able to supply outside concerns that may be able to obtain squill powder.

The study in the propagation of the red squill bulbs in the United States in the cooperative project between the Wildlife Research Laboratory of the Fish and Wildlife Service and the Bureau of Plant Industry is making progress. The laboratory is making bioassays of the bulbs to aid in the selection of the more toxic to plant. About 575 bulbs are now planted in small areas at several places from Florida to California. Some 75 or more of the bulbs have flowered this season from which it is expected to obtain 5,000 to 10,000 seeds. These will be used to enlarge the plantings in the more favorable locations.

Zinc Phosphide—This chemical is made in the United States so the war is not seriously affecting its supply as yet. The two elements, zinc and phosphorous, making up the compound, have so far been obtainable in the grades required for its manufacture so it may be possible to obtain it for a time at least.

Arsenic Trioxide—The Commercial grade of this material can be obtained as yet though it is getting more difficult. The finely pulverized form is not available. Several samples of products, more finely pulverized than the regular commercial form have been bioassayed and the Wildlife Research Laboratory advises that one product on the market gives somewhat better results than the U. S. P. 200 mesh $As_2 O_3$, but less effective than the micronized product.

Barium Carbonate—There is no particular change in the supply of this material insofar as it has come to our attention. There appears to be sufficient on hand to meet present needs.

New Organic Compounds — The Fish and Wildlife Service is studying various alkaloids and glucosides at the present time but as yet none has been found that can be recommended. Extractions are being made and tests for toxicity and acceptance by the rodents are being conducted. The rodent's judgment often wrecks a beautiful product and theory of the investigator.

Repellents

The chemicals showing the greatest repellent effect on rodents are the copper compounds, lime-sulphur, nicotine mixtures, napthonates, and the mercaptans. None of them has completely stopped rats and mice with the methods by which they have been used. Organic chemicals are now being tested and some are showing a repelling effect in the concentrations used. Reports will be released if any prove to be practical for use.

Studies are also being conducted with rat repellent substances incorporated in materials employed for insulating houses. Some promising results are being obtained.

(Continued on page 9)

TABLE III. COMPOSITION OF FOODSTUFFS AND A COMBINED BAIT MATERIAL

	Fats	Proteins	Carbohydrates
	%	%	%
Hamburger	5.41	20.96	0.46
Salmon	12.10	21.8	
Peanut kernels	44.9	26.8	17.5
Olive oil	100		
Cod liver oil	100		
Cheese	7-30	25-33	3-7
Blackstrap molasses	—	3.1	64.7
Sweet potato (raw)	0.7	1.8	27.4
Carrots (raw)	.2	1.2	8.0
Corn meal	1.9	9.2	75.4
Oats without hull	8.1	14.3	67.1
Bread crumbs	0.15	5.39	42.18
Mixed bait	20	6	42

Aqueous Solutions of Boric Acid for Safe Control of German Roaches

By C. S. BARNHART, *The Ohio State University, Columbus, Ohio.*

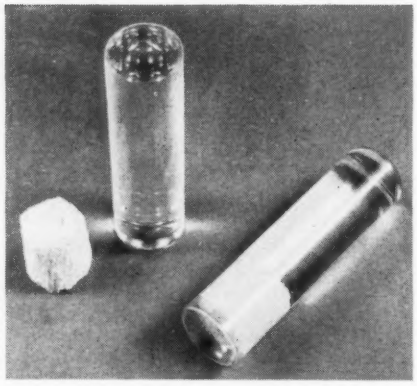
POWDERED boric acid has been known for many years to have some value for control of German roaches (Walter, 1918), but it has not been used extensively because, in comparison with sodium fluoride and pyrethrum, its action is very slow and it is not always effective. However, as it is now available and inexpensive, whereas pyrethrum for civilian use is scarce, it may serve to replace at least part of the quantity of pyrethrum customarily used for roach control where sodium fluoride is not applicable.

Pest control operators object to the use of boric acid powder not only because it does not give spectacular results expected by the customer, but because the liberal distribution of powder necessary for eventual control creates an untidy situation in the treated premises. This note is written to point out that boric acid can also be applied effectively and neatly as an aqueous solution.

Knowing that German roaches customarily drink water from whatever source they can obtain it, the writer made laboratory experiments a few years ago to find out whether German roaches could be killed when offered poisoned drinking water in proximity to unpoisoned water. The tests were run in ½ gallon glass jars, each containing food and a pair of shell vials. One vial contained water and the other an aqueous solution of a substance that was expected to have a toxic effect.

A full vial and stopper, and a full stoppered vial laid on its side are shown in Figure 1. The stoppers are made as follows from absorbent pads 1 foot square, each consisting of about 30 flimsy layers of cellucotton. Two layers of cellucotton are stripped from the pad and rolled into a cylinder about the size of the vials being used. Rolling can be done uniformly on a glass or wire rod. When the cylinder is completed, the rod is removed and the roll is cut with scissors into short lengths for stoppers. Care must be taken to roll the cellucotton in the direction in which it stretches, otherwise the stoppers will not function properly.

Figure 1



Aqueous Solutions of Boric Acid for Safe Control of German Roaches

When used in laboratory and practical tests the full stoppered vials were laid on their sides. The liquid does not run out and the outer wet surface of the soft stopper provides an easily accessible drinking surface for the roaches. As the water evaporates or is consumed by roaches, air pressure forces the stopper to move back in the vial in contact with the receding liquid. Thus the stopper provides a drinking surface as long as water remains in the vial.

In the laboratory tests in jars, a vial containing water and another containing a solution were laid down side by side on the bottom of a jar so that the drinking surfaces were adjacent and equally accessible. Observations were made from time to time on mortality of roaches. The results showed not only that boric acid solutions were effective but that they were much more effective in competition with water than were solutions of substances commonly regarded as poisons, such as mercuric chloride, sodium arsenate and sodium fluoride. Apparently the roaches could not distinguish between water and solutions of boric acid, but were repelled by solutions of other substances, including borax.

These laboratory indications were put to practical tests in an animal building heavily infested with German roaches. Several dozen vials like those used in the laboratory tests were filled with a 1.5% solution* of boric acid crystals, which are preferable to powder because the crystals dissolve more readily. Several of these vials were laid in each room in the building near places where roaches were known to hide. In a few days large numbers of dead roaches were seen in all parts of the building and the total number of dead roaches increased day by day until at the end of ten days very few living roaches could be found. It was felt that the roaches had been cleaned out of this building in a simple, easy and inexpensive manner without hazard to man or animals. Had these vials been continuously maintained in this building, it is unlikely that an infestation could have built up again.

More recently other infested spots on the campus were cleaned up with boric acid solutions by Mr. E. H. Wollerman. Similar trials elsewhere have sometimes failed to give satisfaction for reasons unknown. It is realized that the use of boric acid solutions has not yet been studied sufficiently. However, the method is brought to the attention of pest control operators now because of the need for safe and effective substitutes for pyrethrum in German roach control, and it is hoped that they will give it many practical trials and learn by experience under what conditions it will work best.

The following suggestions are offered for practical tests of boric acid solutions: As it is unlikely that roaches are attracted to aqueous solutions of boric acid, effectiveness should increase in proportion to the

Two Bits

The old Spanish dollar was called "Pieces of Eight". English sailors called it "eight bits" and hence the quarter became "two bits" and the half dollar "four bits".

number of drinking surfaces that are spotted about an infested room. Furthermore, it would be advisable to elminate sources of drinking water, so far as possible.

It is possible that sweetening the solution would make it more effective. It is not known what effect sweetened boric acid solutions would have on ants.

The addition of honey, and possibly glycerin, to the solution might prevent complete evaporation and make frequent refilling of the dispensers unnecessary.

* Saturated solutions should not be used because boric acid will crystallize out as the water evaporates, glazing the drinking surface of the stopper.

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Fond of Roaches

Pantodon buchholzi, an engaging little fish from the East Indies. Unfortunately, few of these are in this country now. Called by fanciers "butterfly fish," they are reputed to be able to fly above the surface of the water, although none of ours ever did while we were looking. Their chosen food is insects, and they enjoy roaches exceedingly. Aquarium specimens seldom are longer than three inches, although they grow to four inches long in the wild.

Some of the Latest Developments in the Control of Rats and Mice

(Continued from page 7)

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More Miles Per Tire

is the object of a new cotton protector that goes between the inner tube and the tire casing, protecting the inner tube from rough and broken cords on the inside of the casing. Thus both can be used longer.

Rough on Rats

To strengthen the anti-rat-and-mouse campaigns, the British Treasury has made an allowance for the upkeep of Government office cats, and the Ministry of Food has set aside "shop soiled" or damaged dry milk powder for warehouse cats.

British local authorities, however, rely mainly on poison and traps, which British firms are producing in greater quantities than before the war. Each local area has an officer whose job is to help shops, houses and warehouses to get rid of rats, and to see that they do not dodge from one area to another.

What! No Vanilla?

An honored cannibal custom, as described in Raymond Kennedy's, The Ageless Indies, is to remove the brains from a victim's head and mix them up with rice beer until the resulting brew has much the consistency of a chocolate milk shade.

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"SOME *Unusual* CALLS *for* HELP"

By DR. W. E. DOVE, *Washington, D. C.*

Editor's Note: The following address was delivered at the Tenth Annual Convention of the National Pest Control Association last October in Pittsburgh, Pa. by Dr. W. E. Dove (in Charge, Division of Insects Affecting Man and Animals, Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, U. S. Department of Agriculture, Washington, D. C.)

WHEN we find a person who is unusually successful, we are inclined to analyze his procedures to see just how he uses them. Almost two decades ago it was my privilege to cooperate with a dermatologist in determining the cause of a skin disease. This eminent physician began the program by holding a clinic for ten days, to which he invited members of the medical profession to bring their patients suffering from skin diseases. In this way he was able to get suitable cases for a detailed study of "creeping eruption." During the clinic my cooperator gave the general practitioner rather complete information on diagnosis and treatment of some of the common skin diseases. When the clinic was started the procedure was so unusual that it was difficult to see just how this reacted to his advantage, but as the work progressed I learned that the different physicians were sending their cancer cases to my friend. In other words, he was helping the general practitioner, and in return the profession sent persons affected with cancer to him, since he was recognized as a specialist in this line.

If a dermatologist specializing in the treatment of cancer could enjoy a profitable practice by assisting others with their unusual cases, might not we consider the possibility of a higher professional attainment by following his profitable example? In other words, can we build a permanent clientele through the kind of service that is emphasized through the work of civic clubs? The lapel buttons of civic clubs, which appear rather commonly in this membership, bear evidence of our realization that he who profits most is he who serves best. We inquire of ourselves—just what can we do to tie in our work with that of others so that reciprocal aids will help everybody?

Have you identified yourself with members of other professions for mutual assistance? In other words, when you treat premises or persons for fleas, do you tell your clients that the fleas on dogs transmit tapeworms to dogs and suggest that they consult a veterinarian? When your local physican sees the bites caused by bedbugs, which he recognizes without difficulty, does he refer his patient to you as being capable of handling the problem of control? When he observes the lesions caused by chiggers, poison ivy, or certain other skin affections that come to his attention, does he mention your name? These are some of the ways in which you can give service, and no doubt you can think of others.

Sometimes when you go on the job you don't see the offending bug. People report that they are bitten, but they are not able to find the bug. To find the offender you have to be guided by the circumstances and by the history of the annoyance.

One such problem, although outside the field of entomology, was unraveled by an entomologist and is closely related to entomology. A frequent complaint in the Southern and Atlantic Seaboard States is of little linear lesions of the skin which remind one of furrows left by moles that plow under the ground. These little lesions vary in width and itch intensely, especially at night. Sometimes a workman who has been on the damp sand under a house or under a car will have his back or limbs covered with these strange lines in the skin. The literature suggested that this disease was due to fly larvae. We found that it was caused by larvae of a dog and cat hookworm.

The affection is known as creeping eruption and is rather common in barefoot children in certain parts of the South. During our work it was determined that this disease was caused by a Brazilian hookworm which is harbored by cats and dogs. Animals having access to play places of children or under houses contaminated the ground with larvae of hookworms. The larvae enter the sweaty back of a man or the tender skin of a child, when the temperature of the skin is about the same as that of the dog or cat, burrowing between the layers of the skin. When they are in the soil the larvae are not difficult to kill. If you let the moisture evaporate from specimens on a laboratory microscope slide, the larvae will die before you can add more moisture. Therefore, drying the soil will kill the larvae. Steam will do it. Sprays with contact insecticides such as diluted creosote oil will also kill the larvae. Creeping eruption represents one of those unusual calls that you might get.

In one of the army camps away from the coast another kind of unusual call was received. The complaints were of some biting insects, and the description sounded much like the annoyance of sand flies, with which most of us in seacoast localities are familiar. But this camp was too far inland to experience such a coastal trouble, for sand flies are known to breed in the salt marshes, and to go only about 30 miles from the coast. The sanitary officer, being familiar with thrips, thought that these insects might have something to do with the bites. Investigation revealed, however, that there were large numbers of shade trees around the camp, and in some of them rot holes were found. These rot holes did not become dry from one rain to another, but contained water and collections of dead insects and other debris; and here larvae of small gnats were also found. They were similar to the larvae of sand flies and continuously produced biting gnats. As the gnats emerged they were attracted by the lights of the barracks, and they gained entrance through the mesh of the ordinary screens.

These gnats may be found wherever shade trees with rot holes are located near bedroom windows. You ask what you can do to give relief. It is a simple matter for a tree surgeon to fill the rot holes with cement or to provide a draining groove so that they will become dry, and he will thank you for passing the problem on to him. If immediate protection from the biting gnats is desired, the regular sprays, or even kerosene, can be applied to the screen. Gnats passing through the meshes will then come in contact with the oil and be killed. Another aid is to extinguish the lights in the bedroom before retiring.

Another and a third kind of unusual call is encountered in the Eastern, Southwestern, and Southeastern

States. People are bitten and you are getting calls from them, but when you visit their premises you are unable to find anything that would account for the annoyance. Here again knowledge of the history of the case would be helpful. It is possible that the annoying bites are caused by the tropical rat mite? This blood-sucking pest is similar to other mites, but it has a preference for rats. In the absence of rats it will feed on the blood of any warm-blooded animal. When young rats leave the beds or when rats are killed in rat-poisoning campaigns, parasites are left behind. These parasites are hungry, and they will feed on the first warm-blooded animal that happens to come their way. If no such animal comes along, they will travel along asbestos-covered heating pipes to various parts of the building. They may find a baby in a crib, or a worker in an office. They are especially annoying to telephone operators, and we know of instances where the entire telephone switchboard was moved into another room to avoid the annoyance of this pest. Apartments have been vacated because of rat mites.

Even though a rat-control campaign is rather general and may cover a large area, calls for help usually come from definite points of infestation. It does not seem advisable to attempt to do anything for rat mites until somebody is bitten. In this way you can get the trouble localized and know just what area needs treatment. In some buildings we have advised the use of an ordinary household spray between the baseboard and the wall. If the spray is forced into the cracks, it not only kills the mites by contact, but it remains there long enough to serve as a barrier to prevent mites from crawling across it. This procedure has been very effective, even when white kerosene has been used without another insecticide. Some pest-control operators have used pyrethrum dust, and others have applied flowers of sulfur with dust guns with apparently good results. The dust was forced into the cracks and crevices with a flat applicator.

To check on results of control measures it is advisable to return to the premises in a day or two after the treatments to make inquiries among the workers or residents. At that time if there are no new bites you can reasonably assume that you have done a pretty good job. On the other hand, if you haven't gotten rid of the mites, the workers will complain, because the mites are certainly going to be hungry.

When you are unable to find an insect, do not conclude that the trouble is invariably due to rat mites. Some of your clients will see bugs that don't exist, and some of them will report that they have had bites for months and months. No doubt, you have already found neurotic people with such complaints. If the trouble is due to the rat mite, most of it will cease in about 2 weeks to 30 days, for by that time the eggs of these mites will have hatched and the newly hatched mites died of starvation. If a client continues to complain for a longer period, he could be neurotic or be sensitive to some food, cosmetic, soap, or flower.

Cheese mites in grocery and drug stores, chiggers, and clover mites produce bites which can be diagnosed on the history of the cases, if specimens can be obtained.

Such unusual calls for help may not of themselves afford a volume of profitable business, but if you have an unusual method for handling unusual calls, you may use them to excellent advantage in helping to develop among the people you serve that priceless thing known as good will.

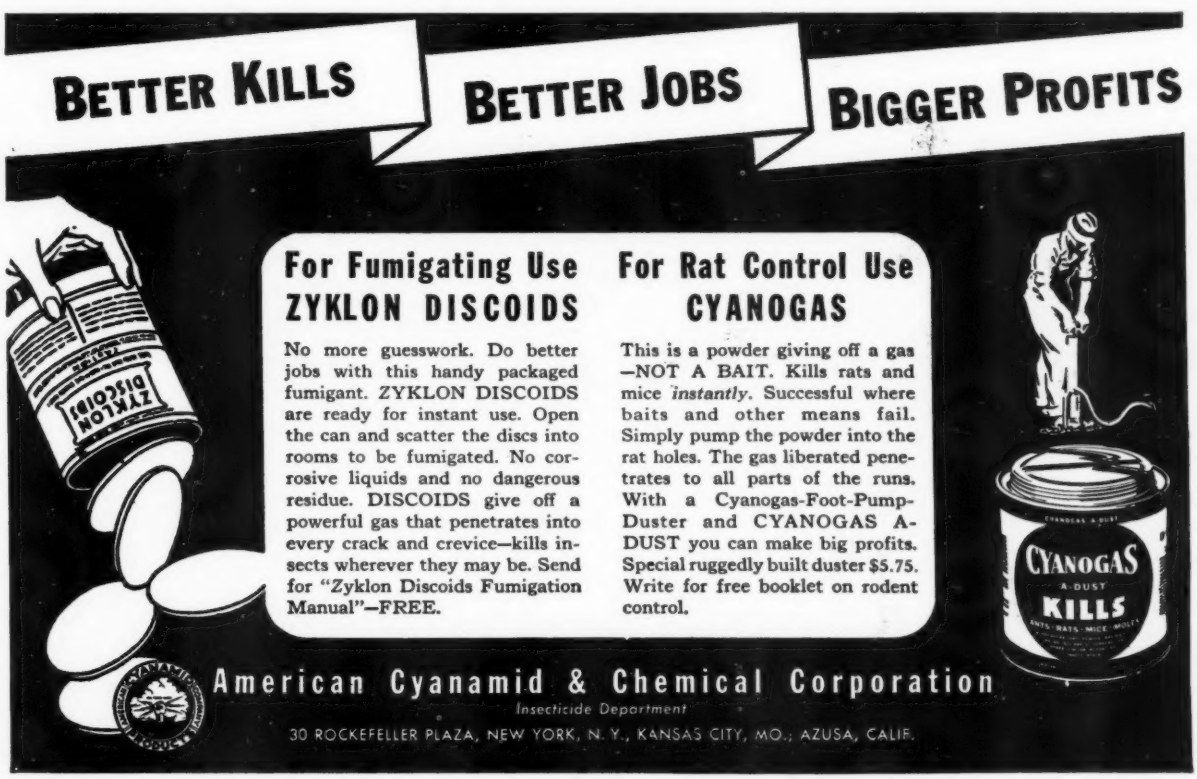
Pleasantry

Have you ever considered the miserable life a moth leads?

How?

He spends his summer in a fur coat and his winters in a bathing suit.

—*The Christian Resister.*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INSECTICIDAL AEROSOLS

By L. D. GOODHUE, *U. S. Department of Agriculture, Agricultural Research Administration, Bureau of Entomology and Plant Quarantine*

A NEW effective method of applying insecticides in aerosol form has been developed, which consists in spraying solutions of the insecticide in a liquefied gas. The tendency for the liquid to escape from the container produces the necessary spraying pressure, which does not change as long as a drop of liquid is present. The dispersion produced by this method is much finer than the mist commonly obtained with an oil spray, approaching smoke in its physical characteristics. This smoke is produced by the explosively violent evaporation of each tiny sprayed droplet. The liquid carrier instantly changes to a gas, leaving only the insecticide suspended in the air. Settling is very slow, and the effective period is therefore 10 to 20 times longer than that of an oil spray. Under certain conditions much of the insecticide will remain in suspension for 1 to 5 hours. Such suspensions are called insecticidal aerosols, since "aerosol" is the scientific term used to denote a smoke or fog.

One of the most practical insecticidal aerosols is produced by spraying an extract of pyrethrum in dichlorodifluoromethane (Freon 12), a liquid that is now in general use as a refrigerant. This aerosol is especially well adapted to the fumigation of aeroplanes for controlling disease-carrying mosquitoes. It is nontoxic to man and animals and yet highly toxic to mosquitoes, flies, and many other insects; it is non-flammable, requires no pumping or power of any kind, is nonstaining, will penetrate into protected places, and can be used in such small doses that passengers are hardly aware of its presence.

A cage of mosquitoes is being placed on hat rack of an aeroplane prior to a test fumigation.

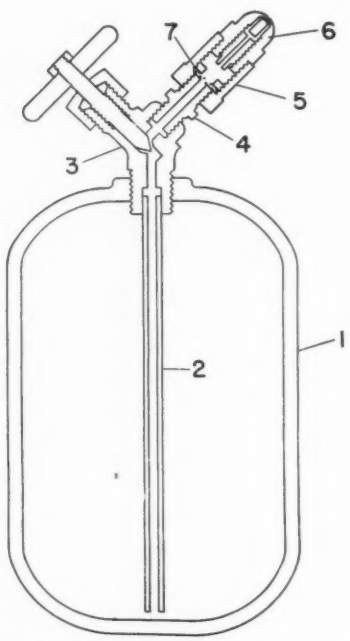


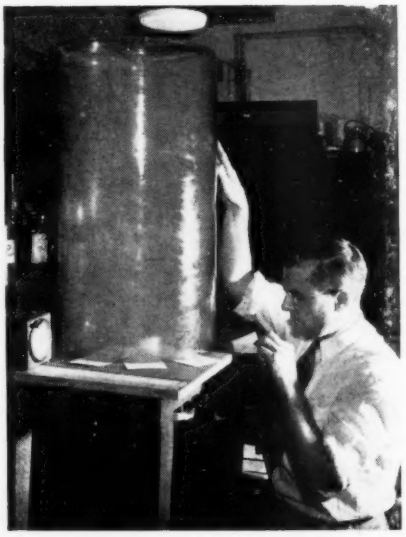
Fig. 1—Diagram showing the apparatus used in the dispersion of insecticidal aerosols. 1, tank; 2, siphon tube; 3, valve; 4, connection; 5, nozzle body; 6, nozzle (oil burner) 7, screen.

One important property of this aerosol is its ability to resist ignition by fire. Freon is, in fact, a more effective fire extinguisher than carbon dioxide.

Little apparatus is necessary to apply this material. Fig. 1 shows the different parts. A convenient container is a 5-pound cylinder such as is commonly used for refrigerants, with a tube inside that will reach from the valve to the bottom. An ordinary oil-burner nozzle of about 2-gallons-per-hour capacity is attached, and the apparatus is ready for use. These cylinders can be filled easily from large supply drums. A can with a valve and nozzle that is inexpensive enough to discard is being developed, and a nonreturnable package is now available for use by the Army.

When applied in this form the amount of pyrethrum that is necessary to kill mosquitoes is very small. Less than 5 mg. (one small drop) of the active ingredients will kill all yellow fever mosquitoes in 1,000 cubic feet. The action is very rapid; a contact period of only 2 minutes is sufficient. To control flies only about 25 mg. per 1,000 cubic feet is required. Larger doses will kill cockroaches, and it is a useful means of control where a nontoxic fumigant is required.

Experimental work is continuing on the toxicity of aerosols to many other insects and on the application of other insecticides in this form. This method appears to be well adapted to greenhouse fumigation. Nicotine, rotenone, thiocyanates, and many other insecticides are easily applied in a liquefied gas. Methyl chloride is an excellent solvent for many materials, and it can be used more economically than dichlorodifluoromethane when a solvent absolutely nontoxic to man is not essential. The use of liquid carbon dioxide is being investigated, but the heavier equipment required is less practical.



This apparatus is used to determine the settling rate of aerosols. The dyed aerosol is collected on glass plates and the amount is determined by a photoelectric photometer. The strip of paper which is being withdrawn protects the slides until the analysis is started.

Boric Acid in the Control of Roaches

WILLIAM O. BUETTNER
Secretary, National Pest Control Association

ELSEWHERE in this issue of Pests appear two interesting articles. Through the courtesy of the Journal of Economic Entomology there is reprinted "Experiments on Cockroach Control," 1918, Vol. 11; Pages 424-429 by E. V. Walter and "Aqueous Solutions of Boric Acid for Safe Control of the German Cockroach" by C. S. Barnhart, Ohio State University. This latter article was written only recently and can be viewed as representing recent developments. By way of Service Letter No. 273 of the National Pest Control Association there is discussed in more detail several opinions and other comments, a portion of which will be subsequently quoted in this brief article.

Why much discussion about boric acid? Generally speaking, boric acid and possibly we should also include borax, are not new to pest control operators, at least among those who have been in business for many years. Boric Acid as an effective roach killer has been relegated to the past and rightfully so in the light of the common and efficacious results obtained from the use of sodium fluoride and pyrethrum or mixtures thereof. Other substances are added to either the pyrethrum powder or sodium fluoride either by way of extenders or on the claims that such additives have increased killing power, results, and ease of application. Existing literature does not reveal a great deal of research that has been done as to boric acid. The necessary all-out efforts being put forth to win the war which as far as roach control is concerned has clarified the need of additional research to determine whether or not boric acid as a non-toxic substance can be considered as a possible substitute for pyrethrum which cannot be supplied in sufficient quantity to meet the normal requirements and purchases desired. There are other substances being tried as substitutes for pyrethrum but we will not discuss these in this article.

We are pleased to receive further comments from Mr. E. V. Walter who as recently as December 4 provided us with these remarks in view of his paper dating back to 1918.

> "In the years since my article was written the author has had an opportunity to use both boric acid and sodium fluoride against several species of roaches, especially in the Southwestern States. My observations indicate that boric acid will control certain species such as the oriental roach and others having waxy body covering, sometimes cleaning out an infestation after sodium fluoride had failed. On the other hand, sodium fluoride seems somewhat more effective in the control of the German roach and certain other species."

The basic problem continues to be with us, however, and that is to continue our efforts to the end that a substitute be developed to tide us over while the situation remains critical with regard to pyrethrum. It is indicated by firms depending largely on pyrethrum that not more than 35% to 50% of their requirements are being received.

One of the speakers at the Tenth Annual Convention held in Pittsburgh, Penna. last October made it clear that boric acid should not be considered as satisfactory as sodium fluoride

(Continued on page 24)

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Experiments on Cockroach Control

By E. V. WALTER, *Ames, Iowa*

Editor's Note: The following article appeared in the Journal of Economic Entomology, Volume 11, No. 5, pages 424-429, and is reprinted by courtesy of the author and the Journal of Economic Entomology. A subsequent statement was prepared by the author which will be commented upon by an additional article that appears elsewhere in this issue, entitled "Boric Acid."

POISON and traps of various kinds have long been used for cockroach control. At best traps cannot be relied upon as a means of extermination, since they only alleviate conditions. Certain proprietary roach poisons on the market have given good results but these are all high in price. Moreover cockroaches are so wary that, when a few have been poisoned, others will not feed unless starved to do it.

The material for this article is taken from notes by the writer while employed as an assistant in the Entomology Section, Iowa Agricultural Experiment Station, in the summer of 1917. The work was undertaken at the suggestion of R. L. Webster when the manager of a local cafeteria called for assistance in controlling cockroaches.

J. A. Lintner[1] seems to be the first writer to tell of the use of borax and mentions having killed many roaches with this material. Since that time powdered borax and powdered sugar, mixed in equal parts, have often been recommended, possibly more than any other materials, since these are nonpoisonous to human beings. Powdered borax and powdered sugar were first used at the cafeteria but gave no relief and no dead roaches were observed after using.

Traps were used at the same time as the borax. These were made by inserting a paper cone, tipped with hair, into a flat bottom flask. The flask was laid on its side, using banana peeling as bait within. This differs from the Graham roach trap described by Washburn[2] since it has only a single cone with a row of bristles at the small end. The Graham trap has a double cone with bristles on the small end of the inner cone.

Two traps were placed beneath the steam-heated serving table in the cafeteria. Trap No. 1 was in a place where diffused light from a window would strike it by day and indirect artificial light would strike it in the early part of the night. Trap No. 2 was in the dark day and night. Other conditions, so far as observed, were equal. Collections were made from the traps at ten o'clock each morning. The hair on the cones did not entirely prevent the escape of the roaches and, as they avoid light, the wide difference in results may be partly explained in this way. Most of the roaches caught here were **Blatella germanica** although **Blatta orientalis** seemed to be fully as abundant in the building.

TABLE NO. 1
COCKROACH TRAPS IN CAFETERIA

Date	Trap No. 1 (In light) Adults	Trap No. 1 (In light) Nymphs	Trap No. 2 (In dark) Adults	Trap No. 2 (In dark) Nymphs
June 9	3	1	1	28
June 10-11	0	0	7	108
June 12	0	4	3	96
June 13	4	18	15	133
June 14	0	26	3	111
June 15	0	49	7	87
June 16	0	18	1	63
June 17-18	0	203	4	279
June 19	1	39	2	167
June 20	0	15	1	100
June 21	0	32	0	331
13 days	8	405	44	1,503

While the traps were being used a new manager took charge of the cafeteria. When he saw conditions this new manager wrote to an agent of a roach poison company who guaranteed to rid the place entirely in thirty days. Arrangements were made for the employment of this agent, who used a white powder, scattering this every place that the cockroaches frequented. This agent would not tell what the powder contained, nor would he sell it, insisting on doing the work himself. The next morning after the powder was scattered on the shelves, floor and in all corners, the floor was literally covered with dead and dying roaches and within a week's time scarcely any could be found, a few days later none at all. Very few roaches were found several weeks later but these may have come in afterwards. The writer scraped up some of this powder and turned it over to Dr. S. B. Kuzirian of the Chemical Section of the experiment station for analysis. His report shows that powdered boric acid was the only thing found.

August 22 a mixture of powdered borax and powdered sugar was again tried in the kitchen of a sorority house. After three days no dead roaches could be found, although they were seen in the mixture and under papers where it was scattered. On August 25 this mixture was removed and powdered boric acid scattered on the shelves and floor. The next morning a number of dead roaches were seen and at the end of ten days only one live roach could be found. None at all were observed on later visits. Boric acid was again tried in the dispensary room of the bacteriology department of the college, with even better success. After four days only one roach could be found and none on later visits.

At another time boric acid was tried on a larger scale in a large grocery store and basement. Although the work here was not done thoroughly enough to completely rid the place of roaches, yet their numbers were greatly reduced. So quickly and effectively did the boric acid work that twenty dead and dying roaches were picked up behind one fifteen foot counter half an hour after it was placed there.

These tests showed the effectiveness of boric acid. Further trials were made to determine how the roaches obtained the material and also to determine further if powdered borax and powdered sugar would not work as effectively. More roaches were trapped and confined in battery jars in the insectary in making further trials.

On one occasion after boric acid had been used at the sorority house one healthy roach and one nearly dead were picked up and placed in the same jar. They were given no food and left undisturbed. One died later in the day but was not removed. Three days later the remaining healthy roach ate the stomach and intestine of the dead one and died in a short time.

This showed that cockroaches ate the boric acid and that, after killing one individual, the boric acid might still be fatal to others. To test this point further five roaches, recently killed with boric acid, were thoroughly washed and the stomach and intestines removed and placed in a battery jar with six healthy roaches. Within four days all of the intestines had been eaten and four roaches had died. The two remaining were not affected, although retained in the jar fully a week longer.

[1] Injurious Insects of New York. First Report, 1882, p. 343.

[2] Journal of Economic Entomology, vol. 6, p. 327, 1913.

From this work it was seen that boric acid readily killed cockroaches upon eating it. Would they eat it more readily if mixed with powdered sugar? In another experiment eighteen roaches were placed in each of two battery jars and the powder placed at one side of the jar. No difference was observed in the effectiveness of boric acid used alone or mixed with sugar. The roaches were placed in the cages at 5:00 p. m. September 12 and by noon September 14 all were dead in both jars.

TABLE NO. 2. BORIC ACID ALONE COMPARED WITH BORIC ACID AND POWDERED SUGAR.

	Boric acid alone	Boric acid and powdered sugar
Sept. 12, 5 p. m.	Experiment started	
Sept. 13, 8 a. m.	7 dead	7 dead
12 noon	5 dead	3 dead
4 p. m.	1 dead	2 dead
Sept. 14, 8 a. m.	4 dead	5 dead
12 noon	1 dead	1 dead
Total	18 dead	18 dead

Up to this time the powdered borax and powdered sugar mixture had been used by the writer only in the open and apparently without success. Thirty roaches were now placed in each of two jars. Borax and sugar were placed in one, boric acid in the other, each at one side of the jar. This was to determine whether the borax mixture would kill the roaches in each case. In this experiment all the roaches in the cage with the boric acid were dead after four days, while it required thirteen days to kill all of them with the borax. Sixteen roaches in the cage with the borax were dead at the end of four days. The sugar caused the mixture to become more compact, evidently retarding its action. No other food was given in either cage.

A few days later the same experiment was repeated using thirty roaches in each cage as before, this time introducing a banana peeling, of which roaches are very fond, into each of the two cages. The powder was placed in a watch glass so that the roaches had free access to it, but need not necessarily get into it. In this case the boric acid killed all roaches in four days, while it took fourteen days to kill them with the

TABLE NO. 3. BORIC ACID AND BORAX AND SUGAR COMPARED

	Without other food		With other food	
Date	Boric acid	Borax and sugar	Boric acid	Borax and sugar
Sept. 13		Exp't started		
Sept. 14		0 dead		
Sept. 15		2 dead		
Sept. 16		14 dead		
Sept. 17		3 dead		
Sept. 18		4 dead		
Sept. 19		0 dead		Exp't started
Sept. 20		0 dead[1]		0 dead
Sept. 21		1 dead		3 dead
Sept. 22		3 dead		5 dead
Sept. 23		1 dead		6 dead
Sept. 24		1 dead		3 dead
Sept. 25	Exp't started	1 dead	Exp't started	0 dead
Sept. 26	2 dead	Total 30	2 dead	0 dead
Sept. 27	13 dead		19 dead	0 dead[1]
Sept. 28	12 dead		9 dead	6 dead
Sept. 29	3 dead		Total 30	1 dead
Sept. 30	Total 30			0 dead
Oct. 1				0 dead[1]
Oct. 2				6 dead
Oct. 3				Total 30

[1] On these dates the borax and sugar mixture was stirred up in order to freshen it. Apparently this made it more effective for more dead roaches were found soon after.

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borax. Dr. Geo. D. Shafer[3] has shown that borax also acts as a contact insecticide killing the roaches in two to ten days through contact of the powder alone.

At another time pieces of apple spread with borax were placed in a cage containing 126 roaches that had been without food for twenty-four hours. This was to determine the length of time required to kill the roaches when they were forced to eat borax in order to obtain other food. In this case eight days were required to kill all of the roaches, although most of them were dead within the first four days.

TABLE NO. 4. BORAX SPREAD ON APPLE

Date	No. of roaches dead and removed
Sept. 20	Experiment started
Sept. 21	14
Sept. 22	57
Sept. 23	29
Sept. 24	20
Sept. 25	4
Sept. 26	1
Sept. 27	0
Sept. 28	1
Total 8 days	126 roaches

The habit of extreme personal cleanliness was observed shortly after the work was begun with roaches confined in cages. This interesting habit, also observed and recorded by Dr. L. O. Howard[4] and Dr. Geo. D. Shafer[5] throws a great deal of light on the reason for roaches eating boric acid.

A cockroach covered with dust or dirt will, when unmolested, begin a process of cleaning. Usually it draws first one antenna after the other slowly between the mandibles, then begins on the legs, later the abdomen, doubling up almost into a ball until it cleans itself thoroughly. Boric acid being a very fine, light powder, readily adheres to the roach and must be cleaned off. The powdered borax and powdered sugar mixture is heavier, and readily hardens if moisture is present, so does not stick as well. The writer has never observed roaches eating either the borax and sugar or boric acid except in their efforts at cleanliness. Boric acid has no effect on the eggs already deposited so unless the powder is left on the shelves for considerable time, treatment must be repeated after a few weeks.

Prices for boric acid vary greatly at the local drug stores. This year (1917) it was purchased at 30 cents per pound. The New York wholesale market report for November 20, 1917[6] gave the price of powdered boric acid at 13½ cents per pound. Sodium fluorid, which is also used to kill roaches, is quoted in the same Journal at 18 to 19 cents. Sodium fluorid was much higher in price than boric acid so was not used in this work.

SUMMARY

1. Traps may be used as means of control but cannot be relied on as a method of extermination.

2. Boric acid is a safe and economical material to use against the roaches as it is nonpoisonous to human beings and yet very effective against roaches.

3. A mixture of equal parts of powdered borax and powdered sugar ground together is effective against cockroaches, is safe and economical, although acting slower than boric acid.

4. Cockroaches eat these substances in an effort to keep clean and not for any possible food value.

[3] Technical Bulletin No. 21, Mich. Agr. Coll. Exp. Station, p. 54, 1915.
[4] The Insect Book, p. 331, 1902.
[5] Technical Bulletin No. 21, Mich. Agr. Coll. Exp. Station, p. 55, 1915.
[6] Journal of Industrial and Engineering Chemistry, December, 1917.

What-to-do about Pyrethrum, Rotenone Scarcities

Themes N. A. I. D. M.'s 29th Annual Meeting . . . Dr. R. C. Roark forecasts Ample Sodium Silico Flouride Supplies 1943 . . . 1942 officers re-elected 1943 term . . .

EXTENDING agents, synthetics, synergists and new potential insecticides were among ways and means offered to cushion effects of war-engendered raw materials shortages facing the Industry by specialists from the U. S. D. A.—W. P. B. —O. P. A.—U. S. Bureau of Public Health—Bureau of Foreign and Domestic Commerce—and representatives of raw materials suppliers,—all of whom addressed the 200 members and guests foregathered at the NAIDM's two-day annual convention at the Hotel Roosevelt, N. Y. C., December 7th and 8th.

In his talk NEW POTENTIAL INSECTICIDES, Dr. R. C. Roark, Chief, Insecticide Investigations Bureau of Entomology and Plant Quarantine, U. S. D. A., Washington, D. C., pointed up the value of sodium silico fluoride as an effective replacement for sodium fluoride. He also indicated that though sodium silico fluoride does not dust as readily as sodium fluoride, micronization should readily overcome this disadvantage. Speaking of pyrethrum, Dr. Roark advanced the opinion that there was no real substitute for it though synthetics were partial substitute.

Dr. E. L. Griffin, Insecticide Division, U. S. D. A., Washington, D. C., noted in his talk AGRICULTURAL MARKETING ADMINISTRATION DURING WARTIME that the war emergency had not changed the "Insecticide Act" in any fundamental respect; labels must still do what they claim; composition statements must be accurate; products when used must not be injurious to vegetation, etc.

Of timely interest was the paper of Surgeon Gilbert L. Dunnahoo, U. S. Public Health Service, Washington, D. C., DISINFESTATION OF AIRCRAFT, wherein he discussed diseases transmitted through plane-transported insects. Dr. Dunahoo voiced the opinion that pyrethrum was better than any known insecticide for plane disinfestation. Both hand spraying in flight, and fumigation on arrival, were methods used to disinfest. Freon method of dispersion, at least for aircraft, will be used, he added.

An insecticide materials symposium featured the Monday afternoon session in which pyrethrum was discussed by Harold Noble, S. B. Penick & Co.; rotenone by R. B. Stoddard, Dodge & Olcott, Inc.; Lethane by D. F. Murphy, Rohm & Haas Co.; Thanite by Friar Thompson, Jr., Hercules Powder Co.; pyrin by Alfred Weed, John Powell & Co.; and Velsicol by A. R. Jameson, Velsicol Corporation.

Barring ODT intervention, Toronto will be the scene of the June mid-year meeting.

The officers elected for 1943 period follow:

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1st Vice-President	Henry A. Nelson
2nd Vice-President	Gordon M. Baird
Treasurer	John Powell
Secretary	H. W. Hamilton

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Melvin Fuld	Three Years
N. J. Gothard	Three Years
Friar Thompson, Jr.	Three Years

CONVENTION NOTES

SOLOMON ISLANDS . . . An interlude of profound interest, near the close of the Convention, was an hour's talk by NBC's commentator, John W. Vandercook titled NEWS OF THE DAY but which in reality turned out to be a talk debunking some of the commonly accepted misconceptions

about the Solomon and New Guinea regions where he lived for about a year or more just prior to the outbreak of war. To hear Mr. Vandercook, a born and engaging raconteur if there ever was one, tell it, the sight of a white man's head does not start a flow of saliva in the mouth of the Solomon islander 'Cannibalistic headhunter" any more than the sight of a cow causes us to think of a good steak; that the crocodile in the crocodile-infested" streams is about as much in evidence or as dangerous as the trout in our mountain streams; and that the insufferably hot climate no worse—and in many respects more comfortable because of the continuous trade winds which blow—than summer in Brooklyn. From which it may be inferred that life for the white man in the Solomons is as secure as it is in good old Brooklyn,—at least Brooklyn since Murder, Inc., lost its charter and some of the charter members.

PYRETHRUM - ROTENONE SUPPLIES: Though some remarks were off the record, it is permitted to state that the pyrethrum-rotenone situation will, in all probability, deteriorate before it gets better,—much depending on shipping facilities available. On which score, one of the speakers, advanced the opinion that future supplies of pyrethrum and rotenone will depend to a large extent on Allied success in controlling shipping lanes from the Far East and North Africa.

Entomological Literature

INDUSTRIAL FUMIGATION AGAINST INSECTS

E. A. Black and R. T. Cotton, Bureau of Entomology and Plant Quarantine, Washington, D. C. 64 p. illus. Price 10c (no stamps.)

MIRRORS AND GLASS-MIRRORED ORNAMENTS

On very rare occasions it has been found after fumigation that mirrors have been fogged or stained as a result of exposure to the gas. Also, in some cases the same condition was observed with respect to blown glass table ornaments having a silvered finish and also to silvered Christmas tree ornaments.

It has been noted that mirrors of good quality are usually very well coated with a material which is impervious to moisture or gases or any of the natural elements which might have a deteriorating effect on the mirrored surface. However, it is conceivable that an inexpensive mirror might have only a light protective coating or it could be the case that, with a very good quality mirror, the coating would permit moisture and gas to get through, as a result of deterioration by aging or scratches. In that case, there would be the possibility of the above described fogging or staining.

Christmas tree ornaments and silvered glass table ornaments are not likely to have much protective coating and it would, therefore, seem advisable to remove these articles before fumigation.

DESIRABILITY OF HIGH TEMPERATURE DURING FUMIGATION

"It is desirable to maintain a fairly high temperature in the building during the fumigation. Insects are not very active at temperatures below 60°F., and they become more or less dormant at 50° or below. In the dormant state they are extremely difficult to kill with fumigants. At 75° they are active and their susceptibility to the gases increases as the temperature rises. For best results a temperature of at least 75°, and preferably somewhat higher, should be maintained throughout the fumigation."

From U. S. Department of Agriculture No. 369—"Industrial Fumigation Against Insects" by Back and Cotton.

—Discoid News Bulletin.

The insecticide "hellebore," supposed to be harmless, is actually poisonous but in small quantities it becomes harmless when exposed to weather for ten days or so.—Science News Letter.

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PYRETHRUM OUTLOOK—

How much will be available in 1943 for household, industrial, and agricultural uses after war needs are satisfied!

Editor's Note: Reprinted from Soap and Sanitary Chemicals, December, 1942.

HOW much pyrethrum will be available in the United States during 1943? How much of this will be needed for the Army, Navy, Lend-Lease and other government purposes? How much, if any, will be left after filling these needs for the manufacture of agricultural products, and household and industrial insecticides for civilian use? On the answer to these questions depends the immediate future policy of the insecticide industry, both agricultural and household, and to what extent the industry will have to rely on expanded supply of synthetic materials. On the answers will also depend the character, type and quantities of various insecticides which will be marketed during 1943 and 1944.

Two months ago, the belief was quite general in Washington and among insecticide material suppliers that practically no pyrethrum would be available in 1943 for the manufacture of industrial and household insecticides for civilian use. The figures as then compiled showed that the demand for the aerosol program for the armed forces plus the needs for regular liquid insecticides for Army, Navy, Lend-Lease, etc., might take ten or twelve million pounds and that no pyrethrum would be left for civilian insect spray manufacture. If there were an excess after Government needs were filled, agriculture would have first call on such stocks, according to opinions from both official and unofficial quarters. In short, the average manufacturer of sprays for household and industrial uses would have to depend wholly on synthetic materials and there was no certainty that the supply of these would be adequate to take care of demands.

During the past month, the pyrethrum situation appears to have changed,— or at least, the outlook seems to have changed based on opinions expressed in Washington as well as those reported from Kenya and London. Whereas the previous outlook was for no pyrethrum for civilian use in the United States in 1943, the latest reports indicate that there may be as much as 4,000,000 pounds or more of flowers available for American agriculture and household type sprays next year. Of this, agriculture will have first call on 2,000,000 pounds and up, leaving possibly some 2,000,000 pounds for household and industrial sprays. Included in the agricultural figure are cattle sprays. In the figure for household type sprays, emphasis is placed on the use of this pyrethrum for food and health protection such as mill and mosquito sprays. Total gallonage will be brought up by the use of additional synthetic materials. This is the general picture of this section of insecticide needs as it now stands.

In attempting to calculate available pyrethrum supplies for 1943, several sets of figures have to be considered. Based on a report from London from the British Raw Material Supply Commission as discussed in Washington, they estimate,—and their figure is held to be rather conservative,—that about 11,000,000 pounds of pyrethrum will be shipped to the United States during 1943 from Kenya. On the other hand, the Board of economic Warfare in Washington hopes that as much as 16,000,000 pounds will be shipped next year. In fact, reports indicate that if the Kenya Farmers' Association will guarantee to ship 16,000,000 pounds or more, the Board of Economic Warfare will agree to an increase in the price of 2½ cents per pound. The present shipping price is 18½ cents per pound and the increase would bring the new price up to 21 cents including cartage and freight to New York, war risk and other insurance extra.

Basing calculations on the more conservative figure of 11,000,000 pounds, the material would likely be distributed about as follows: (1) an allowance of 10 per cent would be made for losses through enemy action, mostly boats sunk by submarines, leaving approximately 10,000,000 pounds. (2) 25 per cent is to be set aside for Lend-Lease requirements. About 2,500,00 pounds would be manufactured into extract and shipped abroad on Lend-Lease mostly to the Suez area. This would leave 7,500,000 pounds. (3) For the Army and Navy, about 4,000,000 to 4,500,000 pounds would be needed. This would allow 1,500,000 pounds for aerosol insecticide bombs, 500,000 pounds for louse powder, and 1,500,000 to 2,000,000 pounds for regular AA and similar sprays. Included in this over-all figure would be something up to 550,000 pounds for the U. S. Public Health Service, partly as aerosol and partly as regular spray for airplane disinfestation and similar work. (4) This would leave about 3,500,000 to 4,000,000 pounds for agriculture and household sprays. On this supply, agriculture and stock sprays would have first call. Mill sprays, and sprays for food processing factories and other essential uses would also receive important consideration. From this quantity would also come the requirements of professional pest control operators for pyrethrum powder for essential industrial insect control. It was reported that an adequate supply of pyrethrum for this latter purpose would be made available from these stocks.

Of course, the foregoing figures are all approximations, almost speculation, and do not add up exactly to the total as given. So many factors which may vary from month to month are involved that no accurate picture of the outlook can be drawn. The main impression which they give is that there may be larger stocks of pyrethrum than was heretofore believed possible. Furthermore, the actual shipments may be nearer to the "hopes" of the the Bureau of Economic Warfare than to the conservative estimate of the British Raw Materials Supply Commission. At the higher price with a greater incentive to produce and ship the flowers, it has been held in Washington that Kenya can boost its

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B. 24
PESTS

output over 20,000,000 pounds by 1944. If sinkings do not take a much heavier toll than previous experience indicates, hopeful thinking makes a total of 15,000,000 pounds for 1943 appear likely.

Right now, stocks of pyrethrum in the United States are low. In order to fill the sudden needs of India for pyrethrum to combat a serious epidemic of malaria, the Kenya Farmers' Association has been forced to cancel portions of contracts on material destined for the United States. These cancellations have approximated 15 per cent of material destined for recent shipment and have not helped the stock situation in the United States. Incidentally, these cancellations are on contracts calling for a price of 18½ cents per pound. Subsequent shipments to replace cancellations will undoubtedly be made at the expected higher price of 21 cents per pound. All told by the end of 1942, about 8,000,000 pounds of pyrethrum will have been imported during the year into the United States. This figure is well below average and accounts along with war demand to a great extent for the shortage today.

The situation in Kenya as reported in Washington is also worth a word or two in comment. Some thousands of flowers were left unharvested this year in Kenya, reports state. Growing costs there have jumped sharply, particularly taxes which have multiplied several fold. The opinion has been expressed that it will take the higher price to the Kenya growers really to get the crop harvested and shipped. At the lower price, shipments are not likely to come up to expectations, but with a 1½-cent increase, higher growing costs will be covered and there will be the necessary incentive to push collection and shipments.

Behind the changed outlook in pyrethrum for 1943 are several factors, chief of which is the reduced estimate of Army needs. Up until a month or so ago, it was believed that the American Army alone would require 8,000,000 or 9,000,000 pounds during 1943. More recently, that estimate has been reduced to 4,000,000 pounds. Where it had been believed previously that the aerosol program of the Army would require at least 6,000,000 pounds next year, reports,—which of course cannot be confirmed,—indicate that only 1,500,000 pounds are now included in the figures for 1943. There is always the possibility that this may be changed again and that the original large quantity may be required for the aerosol program, but at the moment, it looks like 1,500,000 pounds The difference between 1,500,000 and 6,000,000 pounds means that 4,500,000 pounds may be available for agriculture and industrial needs.

If approximately 2,000,000 pounds of pyrethrum are available in 1943 for household and industrial insect sprays and for powder for pest control operators, where will this fit into the general insecticide picture? In other words, how much spray will be needed for general industrial and civilian uses in 1943 and what will this amount of pyrethrum permit in the way of production? Taking 1940 as a basis, something like 8,000,000 pounds of pyrethrum went into household type sprays. But the total output of insect sprays that year was estimated at something over 20,000,000 gallons including stock sprays. The difference was made up by synthetic insecticide materials. In short, the equivalent of some 12,000,000 pounds of pyrethrum was supplied by various synthetic concentrates.

With 2,000,000 pounds of pyrethrum available for household and industrial sprays in 1943,—if this hope materializes,—and if the total output of insect sprays is to be as great as in

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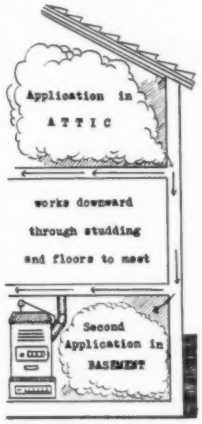

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1940, 90 per cent of the active ingredients would have to be supplied by the synthetic manufacturers. Whether this quantity of the various synthetics is available is not known, but even with the market increase in production, it is questionable. But the chances are that the total production of insect spray will be less than in 1940. Difficulties in securing raw materials alone may cut down the output. Likewise, restriction in consumption of insect sprays to the more essential uses in food and health protection may also limit output. And the effect of container shortages cannot be ignored. But with all this, the demand for insect sprays in view of the general economic situation—great industrial activity, high payroll levels, etc.,—will probably be as great as in 1940 if not greater. How this demand will or will not be filled will depend altogether on production which in turn will depend on raw materials.

It is believed that manufacturers will be able to sell all the insect sprays which they are able to produce in 1943. If that production comes anywhere near the 1940 figure, or even 20 per cent under that figure, the outlook is for a need of sufficient synthetic materials to make the equivalent of 14,000,000 or 15,000,000 gallons of spray. For out of the 2,000,000 pounds of theoretical pyrethrum for household and industrial products must come the necessary powders for insecticide manufacture and for pest control operators. In short, there may be a cut in insecticides available for civilian household use next year, but the demand for insect sprays for industrial and health use will probably more than offset this. It would appear that everything will depend on not only the pyrethrum situation but on the supply of synthetic materials available in 1943

From the angle of the insect spray manufacturer, the difference in the availability of 2,000,000 pounds of pyrethrum in 1943 for household and industrial products might be the difference between day and night. Most of the synthetic materials on the market suitable for household type or stock sprays require the use of a certain percentage of pyrethrum to give their best results. One of two synthetics are recommended for use alone and show effectiveness where they are the sole ingredient of a spray. But with most synthetics, pyrethrum is required for a quick knock-down. Thus the availability of some pyrethrum next year, even only 20 or 25 per cent of normal requirements, will aid in making available a much larger quantity of satisfactory insect sprays where synthetics may make up the major portion of insecticidal ingredients. In short, most synthetics are not satisfactory insecticide materials unless they are used in combination with some pyrethrum. It is conceivable that 2,000,000 pounds of pyrethrum might mean up to 10,000,000 gallons of effective insect spray which might otherwise not be available or which might not be of satisfactory quality.

Pyrethrum Questions

Numerous questions regarding pyrethrum and its control by the War Production Board are being asked frequently in the insecticide industry. In order that the basic situation in pyrethrum allocation may be understood, a well-known pyrethrum expert has prepared a list of the more common questions and has answered them for publication here. The questions and answers follow:

1. Is the distribution of pyrethrum products controlled?

Answer:

Yes. Since June 13, 1942, the distribution of all products containing pyrethrum is controlled by the War Production Board through the medium of Order M-179.

2. Why?

Answer:

There has been and still is an acute shortage of pyrethrum flowers which fact, together with the heavy demands by our armed forces, necessitated Government control in order that the most essential needs for pyrethrum received due care.

3. By whom?

Answer:

The Agricultural Chemicals Unit, Inorganic Section, Chemicals Branch of the War Production Board allocates the distribution of all pyrethrum products.

4. How?

Answer:

Knowing the demands of the Army and Navy, Department of Public Health, Lend Lease, Agriculture, etc., the War Production Board thereby knows how much material they have to allocate on the basis of anticipated imports into this country of Kenya pyrethrum flowers. The War Production Board in allocating material gives due consideration to the importance of the order, i. e., material for the armed forces, Department of Public Health, Lend Lease, Agriculture, etc., together with the amount of material which any given concern consumed in a similar period of 1941.

5. What is the necessary procedure in order to obtain pyrethrum products?

Answer:

First of all, manufacturers of insecticides should stick to their usual and established sources of supply. Secondly, a company entering an order for material should send the duly filled out **"end use"** certification form in duplicate on their own letterheads signed by an officer of the company, which form is designed to express the exact use for which the material is ordered. This "end use" certification form is as follows:

CERTIFICATION STATEMENT

"I hereby certify the War Production Board and to the seller or supplier to whom this certificate is presented that the pyrethrum hereby ordered is for use as..... and will not be used, sold, transferred or delivered by me for any other purpose. This certification is made in accordance with the terms of Order No. M-197 with which I am familiar.

Name of Purchaser.....

By name and title of authorized official

..... "

In the blank space above in the body of the certification the **"end use"** should be placed and wherever possible, it is best to mention the specific types of insects to be controlled.[1]

6. What is meant by "end use"?

Answer:

By the "end use" is meant the exact use for which the products purchased will be used. For instance, the pyrethrum may be used as the toxic in a spray for the Army to control mosquitoes. Or, the pyrethrum may be used as a toxic for a mill spray to control confused flower beetles and other grain insects infesting cereal warehouses, food storage depots, etc.

7. Is pyrethrum being allocated in accordance with any set procedure?

Answer:

Yes. Insofar as it is possible, the established procedure covered in questions 1 to 5 will be followed. Undoubtedly, there will be times when unusual circumstances will alter the set procedure.

8. What are the restrictions as to the amount which can be ordered at any one time?

Answer:

The War Production Board requests that not more than a 30 days' supply will be ordered at any one time. As producers submit customers' orders and "end use" certification statements to the War Production Board once monthly by the 10th of the month, manufacturers should order for the following month.

9. How often can pyrethrum be ordered?

Answer:

Basically, pyrethrum should be ordered only once monthly, but there again it may be entirely possible that unusual demands will necessitate a manufacturer submitting more than one order in a given month. The usual practice is to certify before the first of each month covering your needs for the following month, because your supplier must send this certification down to the War Production Board in Washington by the 10th of each month.

10. Are rated pyrethrum orders affected by the M-179 Order?

Answer:

Obviously, when the Government attaches a preference rating to a given order, it signifies its order of importance. Although the full amount of material requested by any one rated order might be limited because of the lack of supplies, nevertheless rated orders themselves are given preference.

11. How can pyrethrum be conserved?

Answer:

There are many worthwhile synthetic materials on the market which can be used either alone or with a nominal amount of pyrethrum in either liquid or powder form

to stretch out existing supplies of pyrethrum. This procedure is being followed by the Army and Navy, Department of Public Health, Agriculture, Lend Lease, etc., and it behooves manufacturers of insecticide materials for civilian use to follow the same procedure.

12. **If a manufacturer's stocks are for Army and Navy orders, can a replacement be secured by certifying on that basis?**

Answer:
No. Orders received by manufacturers for the Army and Navy must be delivered from materials specifically authorized for that purpose by the War Production Board. No replacements will be given for materials taken out of stock unless previously authorized by the War Production Board.

13. **Can material be secured by certifying through more than one supplier?**

Answer:
The War Production Board requests that manufacturers stick to their usual and established sources of supply and in view of the fact that all requests for material proceed through the same department of the War Production Board, there is no chance of a firm duplicating an order through two different sources of supply.

Died. A nameless mouse of uncertain age; by devouring (by a pink rat); in Hurstmonceaux, England. His distinction: he was green. He was a triumph of the Rev. Dr. Rosslyn Bruce, an amateur geneticist, who bred 50 mouse generations to achieve the greenness.

—*Time.*

WHAT'S NEW IN PEST CONTROL-PERSONALS

NINA ARRIVES: Friday, November 13. Indeed, a lucky day in the Medoff household, for it marks the entirely not unexpected but welcome arrival of daughter, Nina. Mr. J. K. Medoff operates the Hudson Exterminating Co., of West New York, N. J., and is also President of the N.J.P.C.A. Mrs. Medoff and Nina are doing first rate, thank you, but John still shows signs of wear. Congratulations! A full measure of happiness for Nina and her parents is our sincere wish.

WRITES SERGEANT JIMMY LOWTHERS, in the New New York Times, from somewhere in New Guinea: The mosquitoes get worse all the time and the fellows have a saying that they're so friendly they turn our dog tags over and look at the blood count before they take a bite.

Between Fighting Japs:

Swapping tall tales about mosquitos has become a favorite pastime of Allied soldiers in the jungles of Oceania. Here is one, quoted last week from an officer's letter:

The other night one of the fellows claims he heard two (mosquitos) talking in his tent. The first one said, "I'll lift the covers and you carry him out." The second came back with, "Why, if we did that, the big fellows would take him away from us."

DONALR M. NELSON, WPB chief, on the importance of small businesses: "They must not only survive but also become a stronger, more effective force in economic life."

AT FORT RILEY, KANS., Private Woodrow Kirkpatrick crept silently toward an imaginary enemy, crept smack against a real jack rabbit. The jack rabbit kicked him in the eye, sent him to the infirmary. In Manhattan, two psychologists reported that when they presented a rat with a difficult problem he bit his nails.

—*Time.*

Take That

At the University of California, the mailing room of the university's publishing house was reconditioned to discourage termites. The termites retaliated by attacking literature stacked there, including a pamphlet entitled: **The Control of Termites by the College of Agriculture.**

—*Time.*

MAX HILL, former chief of the Associated Press Bureau in Tokyo, in his recent book EXCHANGE SHIP, blasts the legend that the Japanese are a cleanly race. On the contrary. They are thoroughly dirty. Rats, he says, are lucky and boldly infest restaurants in business hours.

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Concerning

PYRETHRUM

The shipments of Pyrethrum Flowers from Kenya have fallen far below expectations, and with the absolutely essential needs of the armed forces at a high level, and with agricultural requirements heavy, the balance for other insecticidal uses must necessarily be small.

Temporarily this forces the use of substitute materials, but from the longer-range point of view, the outlook for Pyrethrum is excellent. Production is being expanded as rapidly as possible, and in time larger supplies than ever before will be available, and in all probability at reasonable costs.
Meanwhile important advances in the technique of processing Pyrethrum and the discovery of better methods of using it are opening the way for great future expansion in the industry.
Pyrethrum is in no danger of losing its position as the primary material for household insecticides.

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INSECTICIDE SPECIFICATIONS

Editor's Note: Reprinted from Soap & Sanitary Chemicals, Dec., 1942.

NEW Federal specifications covering liquid insecticide (fly-spray) (O-I-541) and liquid insecticide (household) (O-I-546) have just been approved by the Director of Procurement for government use beginning no later than March 1; 1943. Wide latitude is allowed in the selection of raw materials in both specifications, the most important requirement in O-I-541 being a performance test, while O-I-546 the essential requirement is a minimum pyrethrin content. An acceptable product under O-I-541 must test no more than 2 per cent below the O. T. I. on knockdown, and must be 16 per cent or more above the O. T. I. on kill. The Peet-Grady test method, as described in the 1942 Blue Book is listed as the official test method.

General and detail requirements of O-I-541 are listed below, together with some of the specified tests on odor, corrosion, staining, etc. Complete copies of both new specifications are available from the Superintendent of Documents, Washington, D. C., at 5c each.

O-I-541

General Requirements

D-1. The liquid insecticide shall not cause irritation to men nor be poisonous to man when applied in the usual manner in the destruction of house flies.

D-2. The liquid insecticide shall have no greater detrimental action upon metal or paint (paint, enamel, varnish, lacquer, etc.) surfaces than the specified solvent (see paragraph F-7a) (4).

D-3 The liquid insecticide shall have no objectional odor.

Detail Requirements

E-1. The liquid insecticide shall be formulated from a petroleum distillate base, free from kerosene odor and practically free from all odor, and shall be clear and free from suspended matter and shall contain other ingredients to make its performance equal to or exceed the requirements stated in paragraph E-2f.

E-2. The liquid insecticide shall meet the following requirements:

E-2a. Distillation range.—

Initial boiling point—Not below 350 degrees F.

End point—Not above 530 degrees F.

E-2b. **Flash point.**—The flash point shall be not less than 125° F. (closed cup).

E-2c. **Residual odor.**—When tested in accordance with paragraph F-4, no residual odor shall be present.

E-2d. **Staining properties.**—Shall meet test specified in paragraph F-5.

E-2e. **Corrosion test.**—Shall meet test specified in paragraph F-6.

E-2f. **Performance.**—The liquid insecticide shall not be more than 2 per cent below the "comparison" insecticide in "average percentage knockdown" and shall be 16 per cent or more above the "Comparison" insecticide in "average percentage kill" when tested in accordance with the method specified in paragraph F-7.

Methods of Sampling, Inspection and Test

F-4. **Residual odor.**—Dip strips of No. 40 Whatman-type filter paper of uniform shape and size in the liquid. Remove and allow to dry for four hours in a well ventilated room at a temperature of 70° to 80° F. Examine for residual odor.

F-5. **Staining properties.**—Deposit three drops of the liquid insecticide upon a No. 40 Whatman-type filter paper. The filter paper shall be so placed as to be clear of an under surface in the area upon which the liquid is placed. Allow the liquid to evaporate at 70° to 80°F. from the paper. On another piece of filter paper, follow out the above procedure using a prepared standard (Standard shall be a Pyrethrum extract containing 100 mg of mixture of Pyrethrins I and II, in proportions occurring normally in commercial pyrethrum flowers, in 100 ml. of "specified" solvent (see paragraph F-7a (4) instead of the liquid insecticide. Examine and compare filter papers, after 48-hour drying period, for status or discoloration. The liquid insecticide shall show no more discoloration than that shown by the prepared standard.

F-6. **Corrosion test.**—The corrosion test shall be carried out in accordance with Method 530.23 (Detection of free sulphur and corrosive sulfur compounds in gasoline) of Federal Specification VV-L-791. Similar to A.S.T.M. Method No. D130-30. Liquid insecticide shall be considered as not meeting the requirements of this specification when on examination the exposed copper strip shows more than extremely slight discoloration as compared with the fresh copper strip.

F-7a. (4). **"Specified" Solvent.** — The "specified" solvent shall be a petroleum distillate meeting the following requirements. (Note: All tests shall be carried out as indicated under test methods specified in Section F.)

Appearance—Clear and free from suspended matter.

Color—Not less than Plus 25 (Saybolt Chromometer).

Distillation Range—Initial boiling point, not less than 350° F.; end point, not above 530° F.

Residue from Distillation—Neutral.

Corrosion Test—Shall meet specified requirements (See paragraph F-6).

Flash Point—Not less than 125° F. (Closed cup).

Odor—Free from kerosene odor and practically free from all odor.

Residual Odor—None.

The specification for liquid (household) insecticide (O-I-546) follows very closely along the lines of the O-I-541 specification, including the same performance test, with an additional detail requirement, however, covering minimum pyrethrin content as shown below. Both specifications were prepared for permanent use. In addition it is planned to issue very shortly an emergency alternate specification of reduced pyrethrin content, for use during the present emergency in view of the present pyrethrum shortage.

O-I-546

E-1. The liquid insecticide shall be formulated from a petroleum distillate base, free from kerosene odor and practically free from all odor, and shall be clear and free from suspended matter. There shall be not less than 0.15 gram of pyrethrin I with the normally accompanying amount of pyrethrin II (see paragraph F-7) in 100 mil. of the liquid insecticide. Any additional ingredients which when incorporated in the product will comply with the requirements of this specification may be used to bring the strength of the product up to the requirements of paragraph F-8. (Peet-Grady performance test. Ed. Note.)

F-7. **Determination of pyrethrin I content.** —Pipette exactly 20 ml. of sample into a 300-ml. Erlenmeyer flask. Add 50 ml. of normal alcoholic sodium hydroxide solution, or more if necessary for complete saponification, connect to a reflux condenser, and boil gently for 1 to 1½ hours. Transfer to a 600-ml. beaker and add distilled water in such a volume that essentially all the alcohol will have been removed when the volume has been reduced to 150 ml. Add a few glass beads and boil until the volume has been reduced to 150 ml. Transfer the contents of the beaker to a 500-ml. separatory funnel and draw off the aqueous layer into a 250-ml. volumetric flask. Wash the oil layer once with distilled water and add the wash water to the aqueous portion. If a slight emulsion persists in the oil portion, break it by adding 3 ml. of a 10 per cent barium chloride solution. (Caution: After adding barium chloride do not shake vigorously, as a reversed emulsion may form which is difficult to separate.) Add the barium chloride aqueous layer and washings. Discard the oil portion. To the aqueous solution add 1 gram of a filter aid and not less than 10 ml. of the barium chloride solution. Do not shake before bringing to volume. Bring to volume, mix thoroughly and filter off the contents of the flask. Test the filtrate with barium chloride to see whether sufficient barium chloride has been added to obtain a clear solution. Neutralize exactly 200 ml. of the filtrate with dilute sulfuric acid (1-4)

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and add an excess of 1 ml. of acid, using 1 drop of phenolphthalein an indicator. Filter through a 7-cm. filter paper that has been coated lightly with an aqueous suspension of a filter aid, on a Buchner funnel, and wash several times with distilled water. Transfer into a 500-ml. separatory funnel and extract with two 501-1 ml. portions of petroleum ether (Federal Specification O-E-751). Wash the extracts with three 10-ml. portions of distilled water and filter through a cotton plug into a clean 250-ml. separatory funnel. Wash the cotton plug with 5 ml. of petroleum ether. Extract the petroleum ether with two 5-ml. portions of 0.1 N sodium hydroxide, shaking vigorously. Discard the petroleum ether. Draw off both portions of the aqueous layer into a 100-ml. beaker. Add 10 ml. of Deniges' reagent (see reagents) and let stand for 1 hour. Add 20 ml. of 95 per cent alcohol and 3 ml. of saturated sodium chloride solution. Warm to approximately 140° F. (60° C.) and filter through a 7-cm filter paper, collecting all the precipitate on the paper. Wash with not less than 10 ml. of hot 95 per cent alcohol and with not less than two 10-ml. portions of hot chloroform, then once with 95 per cent alcohol and then several times with hot water 180-200° F. and place the filter paper and contents in a 250-ml. glass stoppered Erlenmeyer flask. Add 30 ml. of reagent quality hydrochloric acid (specific gravity 1.184) and 20 ml. of distilled water. Cool. Add 6 ml. of chloroform and 1 ml. of iodine monochloride solution (see reagents). Titrate with potassium iodate (see reagents), shaking vigorously after each addition, until no iodine color (red color) is present in the chloroform layer. From the volume of potassium iodate used calculate the amount of pyrethrin I in the sample. (One ml. potassium iodate solution = 0.0044 gram of pyrethrin I.)

Federal Trade Commission Action

Rat Poison

Stipulation 3558 Thursday, November 19, 1942.

J. Vaughn Smathers Clark, trading as Seaboard Chemical Co., Daytona Beach, Florida, selling and distributing rat and insect poisons, including a product designated "Magic Death Rat and Mouse Exterminator," has stipulated with the Federal Trade Commission to cease and desist from use of the words "Magic Death," "Death" or "Exterminator" as part of or in connection with the trade name of the preparation and from representing that the preparation is a competent rat or mouse exterminator; that it will kill rats or mice or that its use is effective in ridding the premises of rats or mice; or that the preparation is nationally known or nationally used. The respondent also will cease using the word "Chemical" as part of his trade name or the words "Chemical" or "Chemists" or other words of the like meaning to imply that he is a manufacturing chemist or conducts or operates a chemical company or business.

Ants Bring Up Garnets from Soil of New Mexico

Ants have mined garnets and peridots in New Mexico for centuries, according to Prof. Stuart A. Northrop of the University of New Mexico.

Northrop, head of the university's department of geology, said the ants, which work down through the volcano soil of the region, sometimes bring up stones worth from $50 to $100 as gems.

Some of the finest garnets in the world have been collected from ant hills near Fort Defiance on the Navajo Indian reservation, the professor said. Fine gem peridots also have come from this region, Northrup said.

—Brooklyn Eagle.

French Urged to Add Rats to Meet Rations

A member of the French Academy of Medicine, addressing a rat-extermination meeting at Paris, recommended rats highly as an addition to the meat ration, a dispatch of the Havas news agency broadcast by the Vichy radio said today.

"Rats are better than pork and rabbit," the speaker was quoted as saying. "If the public were informed of the extremely good quality of rat meat, they would find it good to increase their meager meat ration and they would also help the campaign to exterminate rats."

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Boric Acid in the Control of Roaches

(Continued from Page 13)

or pyrethrum. It was further stated that recent research showed that boric acid is slow but can be expected to give effective results and should at least be considered in the absence of any other safe treatment. How does this tie in with practice? What of our man-power which has been reduced? What of the increased charges that would have to be made for our work because quite obviously more time must be spent on jobs? Will the client have patience when results are not as rapid as we know they would be if we could use what we should?

That now brings me to the observation which I feel has a rightful place in this discussion; namely, the duty of every pest control operator to be mindful of the necessity of conservation in the use of such pyrethrum as will be made available to firms of our industry after the more direct war needs have been supplied. Regardless of our personal arguments of the "must" variety, we shall continue to have with us at least for the duration of the war the critical shortage of pyrethrum. Essentially firms of the pest control industry are engaged in service work although admittedly small quantities are also sold. It would appear to the writer that the following policy, if not already followed, should be stringently adherred to:—

(a) Sell no pyrethrum powder mixtures but reserve all pyrethrum for USE on the jobs you have that require pyrethrum.

(b) Do not use pyrethrum either by itself or in mixture on jobs where sodium fluoride, sodium silico fluoride combinations thereof with extenders, etc. can be used.

(c) In such places where food is kept, prepared or stored and by law or in the interests of necessary safety non-toxic roach powders must be used, extend the pyrethrum by adding borax or boric acid.

(d) Co-operate with the National Pest Control Association by experimenting with other substances that will be submitted or suggested from time to time and above all report such experiences to the Association so that the industry might benefit.

With all due respect to claims that are made about products offered as substitutes for pyrethrum, to the best of our knowledge and belief, it continues to be our considered opinion that there is no product that can claim for itself the same non-toxic qualities and efficiency as pyrethrum or the toxic qualities of fluorides. We feel compelled to make this statement in view of literature, mainly advertising, that has been called to our attention. It would further appear that some of these products being offered, in reality contain borax and boric acid, or fluorides. Such claims should be investigated, especially from the standpoint of toxicological laboratory research and statements for which suppliers of such products be forced to provide sworn statements as a protective measure for firms of our industry who in the last analysis are the "applicators" of such products.

Note of Caution

From now on no one is authorized to accept new OR renewal subscriptions to "Pests." Play safe; send all subscriptions, new OR renewal, direct to Pests, 512 East 14th Street, Kansas City, Mo. Your cooperation will be appreciated—it will also save misunderstanding all around.

The recent discussion with regard to boric acid and borax might lead to an opinion that firms of our industry have never tried these substances. The facts in the case are that most old-timers of the pest control industry thirty and more years ago used both borax and boric acid, adding powdered sugar as an attractant, etc., but with the introduction of the more efficacious pyrethrum and sodium fluoride, discarded the use of borax and boric acid. And we make these comments with full knowledge that some firms have been using small quantities of borax and boric acid all along as one of the ingredients of roach powder mixtures.

Our attempt in this brief article is merely a little "check" on ourselves so that we believe it to be appropriate to submit a few comments that have come to us from firms in the industry as of 1942. We quote from Membership Service Letter No. 273 issued by the National Pest Control Association on December 19, 1942:

1—"Regarding the pyrethrum situation, I am not very hopeful of boric acid from the little experience we had with it some years ago. Maybe we did not go far enough"— There followed another letter from this same source, "I just completed a laboratory test on roaches heavily dusted with boric acid powder. They were all alive at the end of 24 hours and all were dead or nearly so at the end of 30 hours." It was further stated that some field work would be done on the next heavily infested building that had roaches but as yet no report has been received.

2—"I have never felt that boric acid was more than 20% effective. We have given it further trials since the Convention and I still would not raise my estimate. It is much too slow in killing."

3—"Boric acid seems to be about as effective as roach baits are and will at times prevent rapid reinfestation under favorable conditions of cleanliness. It does not lend itself at all to a quick clean-up but in combination with small amounts of pyrethrum, possibly 15% does seem to add to the lasting effect of the powder. I can hardly see it used as an insecticide in any place where food is handled either alone or in a water solution. There can, as stated, be effected

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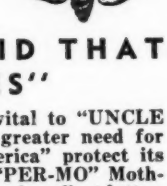
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a saving of pyrethrum by adding boric acid. Until even this mixture of pyrethrum and boric acid is used on a number of places, it would not be wise to draw conclusions."

4—"Yes, some five or six years ago we investigated the boric acid matter and also gave some consideration to borax, but did not adopt either of them in our regular formulas because they fell short of what sodium fluoride plus pyrethrum would do for us. One can get results with boric acid, but it is very slow and I would say scarcely 25% as efficacious as sodium fluoride, from my observation. I am not inclined to compare boric acid with pyrethrum, but possibly compare it with sodium fluoride."

5—"Before we knew much about anything else, much less sodium fluoride and pyrethrum, we used both boric acid and borax. In those days, when it was considered a terrible disgrace to have roaches and one would hardly admit that he had any, there was patience with the "bug chaser" as slowly the infestation was licked. The key to results was as much a case of making the property owner realize that utmost cleanliness must exist and above all, the powder must be left around and replenishments made until all roaches were gone which process might take anywhere from one month to three months. It is our opinion that boric acid lost its strength and additional dusting was required to take care of young roaches which emerged from the egg sacks and by the combination of strict vigilance as to keeping a premises clean and the roach haunts dry where the boric acid powder was dusted, eventually there was success. I would hate to think that any such patience could be expected today when no longer is it viewed the same kind of disgrace to admit having roaches but rather the insistence is that we must get rid of them in the briefest possible time. To summarize, boric acid is not a suitable substitute for pyrethrum. Restaurants, institutions, hotels, food establishments, etc., that are far more regulated today, and patronized, cannot afford to have roaches and it is our job to get rid of them promptly as well as to comply with laws that govern the use of non-toxic substances."

We submit these questions in the interests of having more research done:

1—Would a solution of boric acid and sugar be of more value than a solution of boric acid alone? (This is on the assumption that aqueous solutions will be tried.)

2—What about mixtures of boric acid with sodium fluoride or with pyrethrum? (How far would authorities permit sodium fluoride added be viewed as comparatively safe?)

3—Would particle size of boric acid and an additive to lessen moisture absorption help?

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News From Washington

Insecticide Demand Gains

The large demand for insecticides on the part of the government has been increased sharply in recent months by the ordering of such chemicals and oils in small bottles which are believed to be for the use of individual members of the armed forces abroad. Trade reports indicated that the volume of this business was quite large, but members of the industry declined to discuss the reports other than to confirm that they were obtaining such business.

STRYCHNINE: To date manufacturers have coped with a difficult supply situation very well. The present trend of events would seem to indicate that raw material will continue to be forthcoming, though not easily nor in unlimited quantities.
O.P. and D.R. 12-21-42.

ROTENONE: Plans for the importation of rotenone and the allocation of supplies of roots to processors will be considered at a meeting of importers and processors to be held at Washington, D. C., Dec. 10 by the Commodity Credit Corp.

PARADICHLOROBENZENE: Supplies for essential agricultural needs reported adequate. Prices show no change.
O.P. and D.R. 12-21-42.

TARTAR EMETIC: Not overly plentiful but still being supplied in quantities that permit no genuine need to go unsatisfied.
O.P. and D.R. 12-21-42.

CRESYLIC ACID: Position continues very tight with prices firmly held.
O.P. and D.R. 12-21-42.

CRESYLIC ACID: An added 2 per cent commission on the price of cresylic acid, paid to the British first sellers, may be passed along to consumers here, OPA ruled.

New War Industry Group to Shun Capital Visits

A national committee to aid the war effort, none of whose members will come to Washington, was in process of formation today. Committee members will consult individually with War Production Board Representatives by telephone and letter only and will not be asked to meet here, thus cutting down on the number of people travelling to and from Washington.

The referee board of the chemicals division, through its chairman Donald B. Keyes, announced that the group will be made up of leading research and development men of the chemical and allied industries. They will serve as liason men between their companies or industries and the referee board.

WIRE for rat-proofing refrigerator boxes was released from the general ban on the use of steel and stainless steel, in an amendment (List "C") to the Iron and Steel Conservation Order, M-126, in December.

CHEMISTRY OF INSECTICIDES AND FUNGICIDES

By Donald E. H. Frear
Assistant Professor of Agricultural and Biological Chemistry, The Pennsylvania State College.

This book furnishes exceptionally complete information on all kinds of insecticides and fungicides. For each of the three great classes—stomach poisons, contact poisons, and fungicides—there are several complete chapters, dealing separately with the distinctive chemical groups. In each case, the author describes the chemical reactions by which the particular insecticide or fungicide is prepared, and he explains in detail the most up-to-date knowledge of how it functions, how it causes plant damage, and the extent to which that may be controlled. He puts at your command all necessary additional information—covering spray supplements (materials used as wetting, spreading, emulsifying, and adhesive agents)—processes for spray residue removal—and analytical methods (including macro and micro procedures, used for analyzing the insecticides and fungicides, as well as for determining spray deposits). Here in short is a complete reference book on insecticides and fungicides—to meet every need for information about the fundamental chemistry and its practical application.

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LOCAL ORGANIZATION NEWS

New Jersey Pest Control Association

An enthusiastic meeting of the New Jersey Pest Control Association was held at Hotel Plaza, Jersey City Wednesday, December 2nd. President John K. Medoff presided and incidentally was the recipient of congratulations on the pleasant news that was called to the attention of those in attendance, a daughter born to Mr. and Mrs. John K. Medoff.

The meeting was graced by the attendance and participation of George B. Lay and Ernest M. Mills of the U. S. Fish and Wildlife Service, F. E. Bohman and William O. Buettner, president and secretary respectively of the National Pest Control Association. These men spoke of various activities and especially urged attendance of all operators throughout the state of New Jersey to take in the Eastern PCO Conference that will be held at Massachussetts State College January 11-12-13, 1943. Sidney Wimmer, director of the National Pest Control Association of the New York territory and J. Edwin Sameth, also director of the NPCA spoke of the recent Pittsburgh Convention and the work being done by the Association. Mr. Buettner covered in more detail the problems that confront the industry and need of ultra-conservation in the use of automotive equipment and care of equipment.

Locally, there is progress with regard to the Hudson County Rodent Control Project, Mr. Mills reporting of the demonstration conducted and the story published in the Jersey Journal on September 22, 1942. All members of the New Jersey Pest Control Association are committed to co-operate with this project and reiterated their assurances of giving a day each week to further the interests of this project.

In addition to the above named individuals others in attendance were: Walter Roberts of the Model Exterminating Co.; E. Bancale of Atlas Exterminating Co.; M. J. Schatsberg of the S. & S. Exterminating Co.; William Bancale of the North Jersey Exterminating Co.; Joseph Gorman of Gorman Control Service; Murray Breecher of Federal Vermin Exterminating Co.; Harry Stucker of United Exterminating Co.; J. Strauss of State Exterminating Co.

Philadelphia PCOs Meet

Sigmund Hermann of the U. S. Fumigating and Disinfecting Co., was elected to replace Martin T. Meyer as the Industry member of the Fumigation Examining Board of Philadelphia for the ensuing year, at a dinner meeting of the Philadelphia PCOs on November 27, at the Robert Morris Hotel, that city.

Report on Pittsburgh Convention was made by Dale Fleming, W. C. Sharp and Martin Meyer. Necessity for filling out NPCA questionnaires stressed.

Exchange of credit information, fumigation precautions, fumigation guarantees and termite inspection charges were among the additional subjects under discussion. Next meeting of the group will be held sometime during February. A friendly and constructive spirit pervaded the meeting.

Those in attendance were:
D. R. Fleming, D. M. Fleming
S. J. Hermann, U. S. Fum. & Dis. Co.
W. C. Sharp, Smithereen Co.
Martin T. Meyer, Theodore Meyer Est.
W. S. Boohar, Boohar Chemical Co.
Joseph B. Muth, Western Ext. Co.
John Kavanaugh, Vogel-Ritt, Inc.
Walter M. Casselle, Walter Cohen
Walter Trego Cohen

—Report submitted by Martin T. Meyer.

St. Louis Pest Control Association Re-Elects Officers and Directors

On December 15, at a meeting, preceded by dinner in the Coffee Shop, at the York Hotel, the St. Louis Pest Control Association re-elected the following officers and directors:

President: Wm. F. Exner, 444 East Jackson Road, Webster Grove, Mo.

Vice-President: James C. Logan, Cape Girardeau, Mo.

Secretary and Treasurer: Emil Ganter, 3214 Indiana Avenue, St. Louis, Mo.

Directors: Thos. C. Raley, 1135 Pine St., St. Louis, Mo.; H. H. Cassilly,* 25 N. Newstead Avenue, St. Louis, Mo.; Chas. Denny, 19 W. Big Bend Road, Webster Grove, Mo.

Most of the evening was devoted to discussing plans apropos 1943-NPCA-St. Louis Convention.

*Serving first term.

Report: Chas. Denny.

Arsenical Insecticides Probably Will Be Adequate for 1943

Urging the arsenical insecticide industry to continue to accept orders for minimum normal requirements, the Chemicals Division of the War Production Board has recommended shipment of part of the orders in the immediate future to avoid bottlenecks.

Members of the Arsenical Insecticide Advisory Committee were told at a meeting in Washington, on December 7, that if the hoarding of insecticides is permitted to a degree sufficient to protect maximum requirements in individual localities, the supply cannot possibly be sufficient to cover all emergency needs. The industry is asked to distribute enough to meet minimum normal requirements, but to retain sufficient material to take care of emergency requirements depending on the location of actual insect outbreaks.

The Government Presiding Officer stressed the fact that each company must be responsible for making its salesmen and field representatives thoroughly familiar with the policy outlined above so that they will avoid encouraging farmers or dealers to buy excess stocks of insecticides with possible injury to others requiring materials to combat actual insect infestations.

Sufficient arsenic is being made available currently to produce a volume of arsenical insecticides more than equal to the average consumption of 1941-1942.

Though it might appear, from the text preceding, that a note of easy optimism is in order, it should be tempered by the fact that the release was made well in advance of the termite season and that advent of the Spring may easily change the supply outlook.

Incidentally, if you haven't, as yet, filled in and filed with the NPCA, the ARSENIC QUESTIONNAIRE, which appeared on p. 16, Dec. '42 Pests, or, the one sent you if a member of the Association, it is essential that you do so promptly.

Attention

Tin Plate has been restricted for War purposes only and we are now substituting Black Plate. This in no way affects the design or performance of our Insect Powder Dusters.

Thos. W. Houchin Corp.
87 Ferry Street
Jersey City, N. J.
BUY . . . U. S. War Bonds and Stamps

NOW! That most chemicals formerly used in Rat Control are either unavailable or becoming more difficult to obtain . . .

FOR RODENT CONTROL

G & S RAT GLUE & "2 in 1" RAT BOARDS
available for immediate shipment

G & S EXTERMINATING SUPPLY CO.
1076a De Kalb Avenue
Brooklyn, New York.
Send for descriptive literature and price list.

Additional Snap Shots Taken at Our Recent Convention

No. 1. Headliners all: J. D. Vail, Jr., W.P.B., addressing the Convention, flanked (reading left to right) by Melvin Goldberg, Chemicals Branch, W.P.B., Dr. F. L. Campbell, Chemicals Division, U. S. Dept. of Agriculture, Sec'y W. O. Buettner, Ex-President P. Calvert Cissel and President-elect Pete Bohman.

No. 2. Mrs. A. Srebren, wife of Arthur Srebren, Associated Chemists, Inc., attends her first Convention and evidently finds it absorbing.

No. 3. Melvin Goldberg, Chemicals Branch, W.P.B., discussing the Industry's chemical prospects.

No. 4. Some members of the "Orkin staff": (Left to right) "Teddy" Oser, Mrs. Carl Whitson, Carl Whitson, Otto Orkin and Louis Kotler.

No. 5. The Secretary and President "Shake on it".

No. 6. As usual, our ex-presidents still continue to work in the interest of the National Assn. Our Ex-President Eldridge addresses the meeting in connection with the fumigant procedures.

No. 7. We were entertained at the banquet by one who could not only do card tricks but also remove shirts from those who would look with disdain on the tricks of our Toastmaster.

Cameras, through the courtesies of Charles Opitz and Walter S. McCloud.

WRITE FOR THESE BOOKLETS

The latest helpful information service literature will be sent to you without cost or obligation. If, in addition, there are any particular pieces of literature offered by advertisers in this issue you are interested in receiving, either write them direct, or if you prefer, please send us such requests.

Please note, however, that you must request each booklet on a separate letterhead though they may all be mailed in one envelope addressed to Pests, 126 Lexington Avenue, New York City, N. Y.

FUMIGATION AND PLASTICS

News release discusses use-co-ordination of such diverse chemical products as plastics and fumigants in connection with infested bagged grain, seed, packaged or boxed foodstuffs. Methly bromide-plastic-tarpaulin method of disinfestation described.

WRITE PESTS—DOW

MIRRORS AND GLASS-MIRRORED ORNAMENTS

Bulletin discusses possibility of fogging or staining of mirrors after fumigation.

WRITE PESTS AC-66.

PYRETHRUM vs. ROACHES

Reprint of Dr. F. L. Campbell's two articles of research material, which discusses: action of pyrethrum on roaches, fumigation—; contact action; stomach action; relative susceptibility; pyrethrum powder; pyrethrum extracts; pyrethrum for roach control; summary and conclusions; literature cited.

WRITE PESTS—KEN-YA-PYE.

WHAT'S YOUR ROACH POWDER SITUATION?

Postcard circular contains data making offer of roach powder containing pyrethrum.

WRITE PESTS—FULD.

RAT GLUE PRODUCTS

Circular describes the value of rat boards in the control of rats, the methods for preparing the boards and hints where and how to use to obtain the best results. The glue used in preparing the board, we understand, is odorless, non-poisonous and non-inflammable.

WRITE PESTS—G & S

COLD WEATHER VENTILATION AFTER FUMIGATION:

In times past fumigation fatalities have resulted from improper airing out of fumigated dwellings during the winter months and, in fact, at one time this accounted for about 25% of the fumigation fatalities. This bulletin emphasizes the necessity for proper attention being given to this important phase of the work so as to prevent such occurrences, and gives details of how to properly ventilate after fumigation. Also discusses sealing materials.

WRITE PEST—A-C-65.

THE STORY OF KEN YA PYE

This informative and interesting pamphlet, interspersed with numerous human interest items, takes one on a word-picture tour of Pyrethrum Growing in Kenya, East Africa; and depicts the infinite care used to grow plant so that it may prove effective as an insecticide. (Additional information on Ken Ya Pyrethrum, as an insecticide, in advertising section of this issue.)

WRITE—PESTS—KEN-YA-PYE.

FILM OF VALUE TO PCO

Circular describes a vivid action film of greatest value to every PCO and opportunities it affords PCO to build good will and better public relations.

WRITE PESTS—WIL-KIL.

REFERENCE MANUAL FOR MILL AND WAREHOUSE FUMIGATIONS

Manual discusses: How to prepare the mill for fumigation; proper dosage; how to apply methyl bromide in the flour mill; what to do about winter fumigations; proper venting; warehouse fumigation piping system for mill and warehouses; how to operate methyl bromide cylinders; important precautions; other uses for methyl bromide fumigation, etc.

WRITE PESTS—MANUAL-D.

INSECTICIDES

Pamphlet describes insecticides for carpet beetle control, bed bug control, fly spray, roach spray, mothproofing preparation, Deodorant, etc.

WRITE PESTS—ASSOCIATED.

INCREASED FUMIGATION ACTIVITY

Bulletin describes business opportunity available because of housing shortage.

WRITE PESTS—A-C No. 64.

NEW INSECTICIDE CONCENTRATE

Descriptive literature of new insecticide concentrate based on the esters of carboxilic acid. Manufacturer claims this concentrate possesses higher property than comparative products when diluted in same proportion. Laboratory reports. certificate of analysis also furnished and further data in foregoing.

WRITE FOR YOUR FREE COPY — Chemists, c/o PESTS.

MOUSE TRAP

Circular in which manufacturer claims no bait required, no blood or mutilation, automatic setting, no touching of mouse, rust proof metal construction.

WRITE PESTS—Run-Way.

HIDDEN SOURCES OF INFESTATION

Bulletin outlines whys and wherefores of moth infestation due to improper insulating materials and suggestions to combat.

WRITE PESTS—A. C. No. 56.

Business Opportunities

(Classified)

RATES — For individuals seeking employment, 5c per word, minimum $1.00. All others 10c per word, minimum, $2.00. All advertisments must be in the hands of the publishers seven days before publication date and must be accompanied by cash or money order for payment in full. The publishers are not responsible for any false or misleading advertisments.

Replies to advertisements where box number only is indicated should be addressed c/o PESTS, 512 E. 14th St., Kansas City, Mo., giving box number as well.

Phosphorus Paste

10 lbs., $4.25; 25 lbs., $9.
50 lbs., $17; 100 lbs., $32.50.

For the extermination of rats and roaches.

PEST CONTROL CHEMICALS CO.

P. O. Box 37 ***Write for Details*** **BUFFALO, N. Y.**

NOW YOU CAN BUY

4 to 1 Concentrate

FOR RATS AND MICE

(Just Dilute With Water)

Per-Mo Rat and Mice Exterminating Liquid can be used as a drink or can be mixed with any food and used as a bait.

Economical to use and a "Guaranteed" Rodent Exterminator.

Send $1.00 for a 16-oz. Bottle CONCENTRATE RAT & MICE EXTERMINATING LIQUID. Postage Prepaid.

PER-MO MOTHPROOF CO.

3729 Virginia Ave. **Dept. R** **Kansas City, Mo.**

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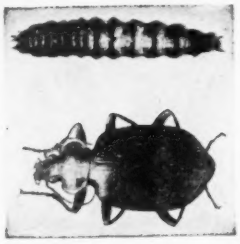

Just Out!

APPLIED ENTOMOLOGY

By H. T. Fernald

Emeritus Professor of Entomology, Massachusetts State College; Onetime Entomologist of Massachusetts Agricultural Experiment Station

and Harold H. Shepard

Assistant Professor of Entomology, University of Minnesota

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